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Event and Comment

Development of the State's Resources.

REPLYING to a welcome to himself and Lady Wilson by the Parliament of Queensland on their return from Great Britain, His Excellency the Governor, Sir Leslie Wilson, remarked that Queensland possessed resources which were denied to other States in the Empire, but its people had the responsibility of developing those resources so that they could pass on a great heritage to future generations.

"No money is wasted if it is spent in developing such a young State as Queensland, whether it be used for the development of industry, the improvement of transport, or that form of development on which I have always been so keen—furtherance of water conservation and irrigation," Sir Leslie added.

Continuing, the Governor said that Queensland was largely an undeveloped State, with great natural assets, and he was confident that they would develop those assets in the future.

His recent visit to England had left him with two outstanding impressions, the first of which was England herself. To-day she was more prosperous than ever before, and her standard of living was higher than for years past. But those factors were not so important as England's standing in the councils of the world.

She stood firm on a policy of commonsense, determined to do all in her power to avoid a world conflagation similar to that of 1914. Other nations looked to her for guidance, and he was convinced that, as a result of that guidance, the world would avoid the disaster with which it was threatened.

The second impression he had received was of the vastly increased interest shown in Australia, particularly in Queensland. Five years ago few people in England appeared to be interested in the Commonwealth or in this State, but to-day business and commercial men knew much about them and were anxious to know more.

He had returned convinced that personal contacts with England were of outstanding importance to the State and to Australia. Without those contacts, either through visits by representative Australians to England or by representative Englishmen to Australia, the two countries could not hope to know as much about each other as they should.

The Governor pointed out that Queensland was the Empire's youngest State, and added that it also was one of the potentially richest. Money and effort spent upon its development, therefore, were well expended, and he was sure that this was recognised by every member of the Legislative Assembly.

"If we as a people are far-seeing enough and brave enough we shall make this State the finest and the most prosperous of the whole of the Dominions of the British Commonwealth of Nations," concluded His Excellency.

Such visits as that from which the Governor had just returned were of untold value to Queensland and to Australia, said the Premier, Hon. W. Forgan Smith, LL.D., who proposed the toast of Sir Leslie and Lady Wilson. They advertised the State and helped the people in the Old Land to appreciate the achievements and aspirations of the Dominion. Sir Leslie had not missed any opportunity of placing Queensland in the forefront, and of giving the people of England an idea of general conditions in Australia.

Modern transport and communication had brought countries closer together, and any conditions affecting Britain or Europe were immediately reflected in Australia. For example, a decline in Britain's national income meant a decline in prices of Australian exports and a consequent shrinkage of our own national income. For such reasons, it was essential that personal contact between the two countries should be maintained. The peace and progress of the world depended upon knowledge and understanding between the nations.

"I am sure that the whole of the people of Queensland are delighted to welcome Sir Leslie and Lady Wilson back here," said the Premier, "for they are held in deservedly high regard and esteem by all sections of the community."

"The Governor symbolises the type of man who has made Britain's history," said the Leader of the Opposition, Mr. E. B. Maher, who seconded the toast. "We live in an unstable world, and the strength and solidarity of the British Empire is the world's greatest hope for peace. A State Governor is the link between the heart of the Empire and its outlying Dominions."

The Export Meat Trade.

DISCUSSING marketing matters soon after his return from abroad, the Governor said that while in Great Britain he had spent quite a lot of time on Queensland affairs. He had been able to tell people who really mattered, perhaps a little more about Queensland than they already knew. In this he had been able to speak from personal knowledge.

He visited Smithfield market and saw shipments of Australian chilled beef being sold, and talked to a number of dealers, who said that Queensland had made considerable progress in chilled beef export during the last two and a-half years, but still had a long way to go. Supplies must be regulated, as regularity was essential, and a certain quantity of Australian beef should reach the market each week. There should not be periods of glut and scarcity. A fast voyage, not exceeding forty-five days, was also necessary. The experts also told His Excellency that Queensland must adopt a definite policy to raise the standard of the beef cattle herds to produce a well-finished, early-maturing animal. Queensland could not really be satisfied until its beef was comparable with the best from other countries. He had been informed that weight grades were of great importance and that hindquarters of chilled beef should average between 155 and 175 lb. Australia, like every other seller, must establish its market, or, in other words, buy its goodwill, whether in chilled beef or in any other commodity.

Wild Life Preservation.

STATE and shire authorities, field naturalists, and other wise people are stirring up popular interest in wild life preservation. This awakening of interest is vivid and significant, and because of it sanctuaries for native birds and animals are being extended in every district. Whole shires have been proclaimed, but the work of education against the folly of destroying a national asset must still go on. In this work the farmer must share. Proclamations and pious resolutions may stimulate public opinion, but that is not enough. No one could be in a better position than the farmer to help in the preservation and restoration of bird life, by which enormous sums in the aggregate can be saved annually to agriculture, and which otherwise would be lost hopelessly through the ravages of crop-destroying insects. Bird life can thus be considered as a farm asset to be protected rigorously and continuously. No one else enjoys contact with living creatures more than the farmer, and no one can benefit by them more directly.

It has been estimated that there are more than four million kinds of insects in the world, and all of them are of significance to mankind. They are mostly open friends or enemies; few are neutral; all compete with man for the world's food supply. Whether man or bug finally inherits the earth will depend, in the last analysis, on which is the more efficient in obtaining the daily ration. In Queensland, we have found that the biological means of fighting insect pests are among the most effective. Birds are among the best of biological agencies, and that is why the boy with the pea-rifle or the shanghai should be encouraged to test his marksmanship, say, on prowling cats "gone bush," and so satisfy his primitive hunting instinct. Therefore, at this time of the year when birds are busily nesting or rearing their young, an earnest appeal is made for active public interest in the protection of wild bird life—one of the cheapest and most effective allies of agriculture.

Groundsel-Bush in South-Eastern Queensland.*

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

GROUNDSEL-BUSH or tree groundsel (*Baccharis halimifolia*) is a native of tropical America which first appeared in Queensland towards the end of last century, probably as an ornamental shrub in Brisbane gardens. As early as 1900 it was reported to have strayed from garden culture into the waste places of townships in Southern Queensland and has since gradually extended its range throughout the south-eastern districts until it now occupies some thousands of acres of pasture, forest and waste lands. Beyond the boundaries of the City of Brisbane, within which the weed is very prevalent, groundsel-bush has assumed serious proportions on the North Coast within the Shires of Caboolture, Landsborough, Maroochy and Noosa. The Shires of Pine and Widgee are less heavily infested, whilst light infestations may be expected to be present in shires adjacent to those enumerated. On the South Coast the degree of infestation appears to be light, though a thorough survey may reveal the position to be somewhat worse than casual observation would indicate.

The plant is a perennial shrub or small tree, which has no use in agriculture and which is of very little value for grazing purposes. Much of the groundsel-bush occurring on agricultural and pastoral lands is of a fairly young age and the plants either have not developed beyond a height of about 4 feet and a stem thickness of 1 inch or have been kept in a stunted condition by periodic "brushing." If allowed to grow unhindered the weed may reach a height of 15 feet and attain a stem diameter at the base of 7 inches or more.

The main method of spread of groundsel-bush is by seed. Each "seed" is very small, but is provided with an attachment of hairs which aids in transportation by air. The most prolific spread of the weed is by means of wind-borne seed, but the prevalence of the plant just above the high-water level of streams and drainage canals suggests that dispersal by means of running water may be of some importance. The carriage by people of the showy inflorescences from place to place no doubt also constitutes a common method of spread.

Whilst groundsel-bush is found commonly on vacant allotments about townships and on neglected forest clearings, its most frequent occurrence is in open grasslands, in ringbarked or partially cleared forest, and on abandoned and neglected orchard or crop lands reverting to scrub or forest. So far as could be ascertained in a survey which was by no means intensive the status of groundsel-bush as a weed of agricultural and pasture lands is as set out hereunder.

Groundsel-bush on Cropped Lands.

Practically all of the cropped land within the groundsel-bush-infested districts is devoted to fruits and sugar-cane, and the inter-row and other cultivation associated with the culture of these crops is sufficient to prevent the establishment of most of the seedlings which

* This article is an abridgement of a report submitted to the Hon. the Minister for Agriculture and Stock following a brief survey of the groundsel-bush position in South-Eastern Queensland. Local authorities, community organisations, the Agricultural Bank and various field officers of the Department of Agriculture and Stock provided valuable co-operation.

appear. Occasional instances were noted of groundsel-bush plants developing within the rows of a sugar-cane crop or in open places in the inter-rows after cultivation of the standing crop had ceased. Such cases indicate the need for regular inspections of standing crops and the use of the "grubber." Where simple precautions of this nature are taken the likelihood of invasion of lands under crop is reduced to a minimum.

The menace to crop lands appears to lie in weed rotations and in temporarily abandoned or neglected areas. Cultivated land is commonly thrown out of orchard and other crops and allowed to revert naturally to grass or weeds as a renovation measure. Where groundsel-bush establishes itself in profusion on crop lands in the grass or weed stage of the normal crop rotation, some trouble may be experienced in cleaning the land of the groundsel-bush when cropping is again to be undertaken. Strict supervision of all lands set aside for soil renovation purposes should be exercised and groundsel-bush eradicated as it appears. Neglect to attack the weed in the early stages of its invasion may result in an infestation so dense as to render restoration of the land to crop both difficult and expensive.

The abandoned or neglected area, on which groundsel-bush is permitted to develop unhindered, in some areas appears, almost without exception, to proceed to the stage at which the vegetation consists almost wholly of groundsel-bush in a dense thicket. The reclamation for agricultural purposes of land in such a degraded state presents a difficult problem, and the rather frequent occurrence of groundsel-bush thickets throughout the agricultural lands of the Maroochy River district must be viewed with some concern.

Groundsel-bush on Pasture Lands.

The occurrence of groundsel-bush in pastures of paspalum, Rhodes grass and Kikuyu grass, the use of which has been more or less confined to fertile soil types, is not particularly marked. In most instances these grasses, by virtue of their sod-forming characteristics, form a pasture which is closed to even the most aggressive weeds. Exceptions occur when a poor stand results from the initial planting or when a marked decline in vigor of the pasture or opening up of the stand due to soil exhaustion, drought, improper management, &c., is evidenced. Normally, however, there appears to be no danger of groundsel-bush establishing itself in high-class pastures and depressing the grazing capacity of the land. No doubt seedlings of the weed make their appearance in the inevitable openings which occur in even the most vigorous pastures, but the combined effects of root competition and of grazing of the young weed plants (the latter a corollary of proper grazing practices) ensure the maintenance of a pasture sward with an extreme low proportion of foreign herbage.

Failure to obtain a good strike and rapid development of sown or planted pastures, particularly on "scrub" burns, provides an opportunity for aggressive weeds to take possession of the area. Groundsel-bush, with its facility for mass spread, is well adapted to invade poorly grassed areas which are not protected by topographical or other features from infestation. Some of the most extensive and dense stands of groundsel-bush observed were mass infestations of steep slopes on which the sowing of paspalum seed following a burn was a failure. Fortunately, instances of this nature appear to be infrequent, but the examples seen indicated one aspect of the potential danger of groundsel-bush to good pasture lands.

The employment of severe pasture renovation measures, such as ploughing or drastic harrowing, provides soil conditions suitable to the establishment of groundsel-bush and it appears advisable that farmers should carry out pasture renovation well in advance of the seeding

Plate 261.
Groundsel-bush, showing leaves and inflorescence.

period of the weed, by which time a close sward that will resist invasion should be developed. As an added precaution, renovated areas should be examined at frequent intervals during the few weeks directly following ploughing or harrowing and any groundsel-bush plants dug out.

Pasture deterioration due to old age, drought, mismanagement, &c., is conducive to groundsel-bush infestation and many cases were brought

under notice in which dairymen occupying farms within range of seed-reservoirs of groundsel-bush were obliged regularly to dig out young groundsel-bush plants from paspalum pastures of an order just lower than first-class. It is the medium and low quality paspalum pasture lands that, of all the valuable lands of the North Coast, are threatened most seriously by groundsel-bush. Many holders of land falling within these categories appear to realise the necessity for unceasing vigilance and the careful farmer usually finds it practicable to control the pest on his sown pasture areas. The employment of control measures tends, however, to become a heavy burden to farmers whose pastures lie within the zone of dense flights of wind-borne seed.

The self-established type of pasture which occurs on ringbarked or partially cleared forest land offers, due in part to its nondescript nature and in part to the loose management usually applied to it, a fairly open field for groundsel-bush establishment. Much of this type of pasture is, however, protected from the weed because of the dryness of the soil. Where the original forest has developed under fairly moist conditions groundsel-bush may be considered a potential menace to the pasture which follows on clearing. On dry ridges no heavy infestations were observed, but the paucity of the weed there may be attributed possibly to the fact that dry, broken, forest country is seldom cleared in any but a light fashion and the shade cast by the green trees is sufficient to prevent heavy groundsel-bush invasion. Where groundsel-bush was observed on dry, forest country it was restricted largely to the edges of the forest or to cleared spaces.

Reclaimed or partly-reclaimed swampy and marshy country appears to be a very suitable situation for groundsel-bush. Only a few thousands of acres of this type of country have been improved for pastoral or agricultural purposes, but it has been found that removal of the green timber and draining predispose the land to heavy groundsel-bush infestation.

Requirements for Groundsel-bush Development.

The climatic conditions required by groundsel-bush for its normal annual development, including seed ripening, appear to be a long, warm summer and an annual precipitation of more than 40 inches of rain, of which most occurs in the summer. These are the conditions experienced in the strip east of the coastal ranges. To the west of the ranges the rainfall may be too low to permit of groundsel-bush developing and spreading, though in "soaks" and other moist places establishment may occur.

The elevational range of the plant is from sea-level, or lower, to the highest points of the Blackall and other coastal ranges. Although the densest and most extensive stands occur at low altitudes, this may simply be due to the fact that the original distributing centre was near sea-level. As a matter of fact, a particularly dense stand of groundsel-bush was observed high up on the Maleny plateau in close proximity to an area where the plant had once been cultivated.

Infestations were observed on all slopes and exposures, but dense stands were seen only in those situations exposed to seed-bearing winds. Close to the coast the prevailing winds at seeding time of the groundsel-bush are south-east in direction and country with a north-western exposure is protected to some extent from wind-borne seed. On the higher parts of the Blackall Range the winds experienced at seeding time

have a westerly component and on the lower slopes heavy infestation from the highlands is confined to country facing the west. Although wind-borne seed appears to be the main source of infestation of new areas, transference of seeds by water probably is a channel by which clean areas may become infested.

As previously indicated, groundsel-bush occurs on a wide range of soil types, including rather dry, infertile forest soils, rich volcanic loams and low-lying clay soils with a high moisture content. Though plants of the weed were observed in some very damp situations, permanently water-logged areas appear to be immune from heavy infestation. Nevertheless, soil moisture content seems to be a limiting factor, the most vigorous and densest stands occurring on soils well supplied with moisture. Healthy, well-developed plants occur just below high tide mark near the mouths of several coastal rivers. Some evidence that, other things being equal, eroded soils are more favoured by the weed than are entire soils, was collected, but no definite conclusion was reached on this point. Since the soils within the groundsel-bush-infested region naturally are generally acid in reaction, no information concerning the limits of soil acidity which the plant will tolerate was obtained.

The light requirements of groundsel-bush appear to be high. No infestations were observed in dense "scrub" nor in virgin dense forest. Invasion of these types of timbered land does not occur until the timber is thinned out and abundant light admitted.

Effect of Groundsel-bush on Animal Health.

As a consequence of reports of suspected poisoning of stock by groundsel-bush on the north coast, feeding experiments were conducted at the Animal Health Station at Yeerongpilly some years ago. Two Jersey heifers were fed for thirteen days on a ration of chaff and groundsel-bush leaves in almost equal proportions by weight. Neither animal showed any sign of ill-health other than a tendency to constipation. Three guinea pigs fed exclusively for twelve days on groundsel-bush leaves became greatly emaciated and anaemic and one died, apparently from malnutrition.

Information collected during the course of the recent survey corroborated the conclusions which may be drawn from the feeding experiments. Stock browse groundsel-bush to only a slight extent when ample nutritious grass is available. When grass is scarce the groundsel-bush is grazed, often quite heavily. Animals ingesting large quantities of the weed daily over a long period lose condition and milking cows drop considerably in production. Any effects on the stock appear to be due to malnutrition rather than to poisoning.

Control of Groundsel-bush by Natural Agencies.

The only natural agency which appears in Queensland to exercise more than a slight degree of control over the development and spread of groundsel-bush is climate. To what extent meteorological conditions restrict the weed is not definitely known, but west of the coastal ranges the climate probably prevents establishment and growth.

White wax scale, accompanied by "sooty mould," is a common pest of groundsel-bush throughout its whole range in Queensland, but only in isolated instances has it any marked effect upon the health of the plant. It is possible that infestation by the scale and its associated

fungus hastens the end of sickly plants, but vigorous plants of all ages show little ill-effects. White ants have been reported as destroying occasional plants. No pathogenic fungi have been observed to attack the plant, and the only physiological disturbance which has been noted is a die-back of terminal shoots that has been attributed to unfavourable soil moisture conditions.

No information is available concerning the incidence of pests and diseases of groundsel-bush in other countries. Little hope is entertained that biological control will prove feasible, but any attention that can conveniently be given to the matter is warranted.

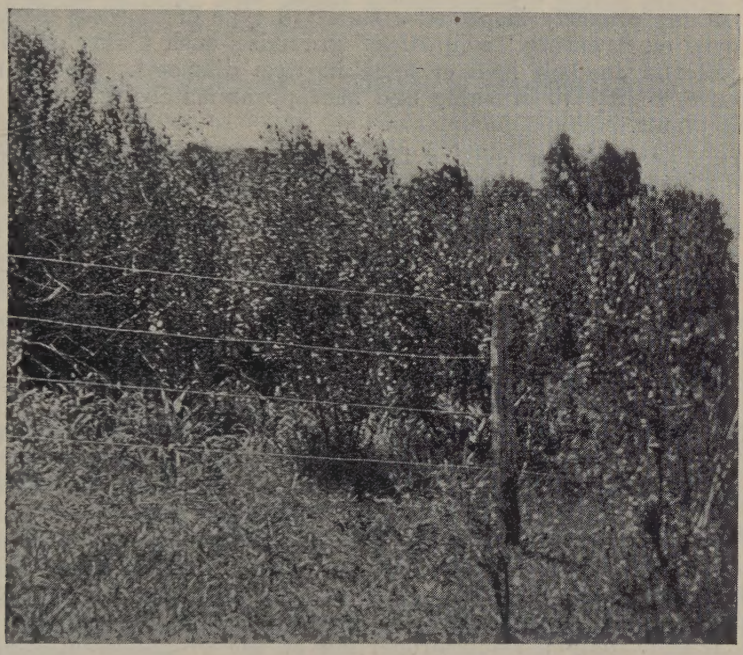

Plate 262.
A coastal pasture invaded by Groundsel-bush.

Mechanical Methods of Control of Groundsel-bush.

Landholders within the groundsel-bush-infested region employ various mechanical methods aimed at the control and eradication of the weed. These include digging ("grubbing"), cutting ("brushing" and mowing), pulling or dragging, ploughing and burning.

Digging.—The use of the "grubber" has been found a fairly effective means of exterminating groundsel-bush on lightly infested land. To prevent regrowth it is necessary to remove all underground parts which are capable of shooting if left in the soil. This is simply done when the plants are young, but older plants may develop a deep tap-root, extensive lateral roots, or underground running stems, all of which are difficult to remove entirely.

The eradication of dense stands of groundsel-bush by digging demands the expenditure of a large amount of labour and in some instances, at least, is beyond the capacity of the landholder to accomplish.

Cutting.—"Brushing," with or without subsequent poisoning or "firing," is the commonest method employed for dealing with heavy infestations of groundsel-bush. It is generally held that "brushing" at budding or during blossoming is effective in weakening the plants and many may die. Regrowth is, however, far from eliminated by "brushing" alone, and poisoning or "firing" following "brushing" has been adopted by some farmers. Arsenical solutions swabbed on the butts appear to give a good "kill," but some danger is occasioned to stock. "Firing" a "brushed" area possibly increases the amount of weed destroyed but does not appear to be as effective as poisoning after "brushing."

On one property inspected a standard type of mowing machine is employed on flowering "whip-stick" groundsel-bush plants up to three feet tall and one-half inch or more in stem diameter. The action is, of course, similar to brushing and has approximately the same effects on the plants.

It is probable that cutting frequently during the season of growth would kill the plants, but such a procedure would hardly be economic.

Pulling.—On certain soil types in wet weather or after rain young groundsel-bush plants can be pulled out by hand, but this method of eradication is practicable only on a small scale.

On one heavily infested, lowlying property a tractor-drawn, triangular drag of flanged steel rails has given fairly good results. The apex of the drag is drawn foremost and in sliding between two groundsel-bush plants with large crowns levers them out of the ground. The jolting of the rails also levers out many plants. Young plants with a poorly developed crown are seldom uprooted, whilst a proportion of the well-developed plants escape permanent injury. It has been suggested that a modification of this implement, or a mallee roller, would prove fairly effective.

Ploughing.—Plants which have not attained the stature of a tall shrub or tree can be effectually eradicated by ploughing and subsequent harrowing. Because very little of the pasture land on the north coast is ploughable, only a small proportion of the groundsel-bush-infested country could be so treated.

Burning.—Dense stands of groundsel-bush will take a running fire or a flamethrower fire quite well when the plants are maturing and burning of an area on which there is a good body of grass will cause damage to groundsel-bush plants of all ages, but regeneration from protected portions of the plants is quite common and burning alone does not appear to offer a particularly effective means of eradicating the weed.

Covering.—Though groundsel-bush is intolerant of shade, there seems to be little prospect of successfully exploiting this characteristic for control purposes. The principle of prevention of growth by light exclusion may perhaps be applied in special circumstances by encouraging the growth of, or even by making special plantings of, trees.

Flooding.—An area of groundsel-bush-infested pasture which had been submerged in fresh flood waters for three days some short time after being partly "brushed" was inspected. Both entire and "brushed" plants which were completely submerged during the period of flooding had perished, whereas plants which had been only partially

covered or which had suffered immersion for only a short time survived. At the present time the employment of flooding for groundsel-bush destruction is nowhere practicable.

Heavy Grazing.—It has already been remarked that on well-managed pasture areas any groundsel-bush seedlings which appear are destroyed by the stock. One of the requisites is periodical heavy concentration of stock on the area. On undergrazed pastures weed development is encouraged, whilst continuous heavy grazing weakens the pasture plants and permits of groundsel-bush intrusion. Stock may, therefore, be used as scavengers of very young groundsel-bush, but on areas heavily infested with woody groundsel-bush plants grazing stock have little influence on the weed.

Chemical Methods of Control of Groundsel-bush.

The only weedicides which are employed in groundsel-bush eradication are arsenical in nature. Arsenic pentoxide is favoured by most landholders because of cheapness and convenience, but proprietary mixtures are used to some extent. Chlorates and other materials non-poisonous to stock do not appear to have been tested.

Arsenical preparations are employed most commonly for swabbing the butts of "brushed" plants and appear to give good results. The method has not been standardised and little information could be secured concerning costs of application.

Some farmers have used arsenical preparations in the form of sprays. Penetration of the poison is declared to be less efficient than might be desired. This may be due to run-off from the smooth leaf and stem surfaces (in which case a spreader is indicated), or it may be the result of high resistance offered by the plant surfaces to the action of corrosive substances, calling perhaps for the addition of concentrated sulphuric acid or some other strongly corrosive material to the arsenical solution.

The best time of application of sprays to groundsel-bush appears to be in late summer, towards or during the blossoming period, but the information obtained on this point was suggestive rather than positive. Young suckers which appear after "brushing" or burning are said to be very susceptible to destruction by sprays at any time of the year, as also are seedlings.

Resumé of Practical Control Measures.

The small-scale spread of groundsel-bush may be checked if landholders of all descriptions dig out the occasional plants as they appear on their properties, and eradicate by digging any adjacent small patches which may be acting as breeding grounds. (In several localities grazing farms were examined which were infested to the extent of only a few bushes, yet these were allowed to remain to constitute a potential source of wholesale spread.)

The treatment of existing stands will vary according to circumstances, though it must be confessed that the control and destruction of dense infestations presents, in many instances, a task of considerable magnitude. Infestations of medium to high density do not appear to be controllable (except to the extent of preventing seed-setting) by simple mechanical measures such as digging, pulling or infrequent cutting, nor does the encouragement of natural enemies offer much promise.

The use of a weedicide seems definitely indicated, and until some treatment combining efficacy, economy and safety is elaborated the use of arsenic pentoxide dissolved in water might be advocated for dealing with infestations rather too dense to warrant the employment of manual methods of eradication.

Some community effort to eradicate, or to eliminate the potency of, breeding grounds on public roads, &c., and on abandoned properties might be urged. This could take the form of destruction of colonies or of cutting back prior to seeding. Such action is particularly desirable where the occurrence of the weed is a menace to clean areas.

Summary and Conclusions.

Groundsel-bush is an American weed which, since its escape from garden culture over thirty years ago, has invaded some thousands of acres of agricultural, pastoral and waste lands in the coastal portion of south-eastern Queensland.

Though cropped lands are as yet not extensively invaded by the weed, a task of some magnitude lies in the reclamation of numerous temporarily abandoned and neglected areas on which a dense infestation of groundsel-bush occurs.

Vigorous pastures of the sod type are little affected. Fertile pasture land on which a poor cover of grass has followed sowing or on which the pasture has been opened up by drought, mismanagement or old age is fairly readily invaded and a considerable area is infested to some extent.

Except for the small proportion which occurs on moist soils, the self-established pastures of medium to low class forest country have not suffered a heavy infestation, although further destruction of the existing timber may lead to increase of the groundsel-bush.

Reclaimed or partly-reclaimed swampy or marshy country offers a very suitable habitat for groundsel-bush and serious infestations occur on this type of country.

The effect of groundsel-bush invasion of pastures is to lower pasture production and to undermine the health of stock forced to graze upon the weed.

Though groundsel-bush is attacked by one or two natural enemies, these appear to have but little effect upon the plants and to exercise only slight control of their development and spread.

Various mechanical methods of treatment of groundsel-bush are effective in eradicating light infestations, but some form of chemical treatment appears to be indicated for the control and eradication of dense stands.

The critical investigation of control measures applicable to existing dense stands seems to be warranted.

Yellow Spot Disease of Pineapples.*

H. K. LEWCOCK, M.Sc., Senior Research Officer.

YELLOW spot was first recognised as a specific disease of pineapple plants in 1926 when it made its appearance in Hawaii on the island of Oahu, but a description of the disease was not published until five years later.[2] For some time the disease was confined to the Hawaiian Islands. In 1928, however, it made its appearance in the Philippines, having probably been introduced there in planting material obtained from Hawaii.[6]

For six years following the first published account of yellow spot nothing even remotely resembling this disease was found in Queensland pineapple plantations, notwithstanding that the insect which transmits the disease from plant to plant, namely *Thrips tabaci* L., was known to be prevalent on pineapples in Queensland even before the disease was reported from Hawaii. Early in October of this year, however, a diseased pineapple fruit was submitted for report from a grower in the Mary Valley and the disease symptoms present in this fruit appeared to be identical with those which have been described for a particular phase of yellow spot disease in Hawaii. This tentative diagnosis was verified by an inspection of the plantation from which the diseased fruit had originated. During the course of this inspection, the characteristic foliage symptoms of the disease were clearly recognised on the leaves of affected tops and in nearly all cases these leaf symptoms were associated with necrosis (breaking down) and decay of the apical fruit tissues.

This outbreak of yellow spot disease which, as yet, is the only one to have been observed in Queensland, was confined to the tops of maturing fruit in a two-year-old plant crop field. At the time the field was inspected most of the fruit had already been harvested, but of those remaining, between one and two per cent. were affected with the disease, mostly to an extent which rendered them valueless. In Hawaii, yellow spot affects young plants which have been propagated from tops to an even greater extent than it does the tops of maturing fruit. However, no top plants of a susceptible age were located in the vicinity of the affected plant crop field in the Mary Valley and it is not yet known to what extent the disease may affect young plants under Queensland conditions.

Description of the Disease.

The progressive stages in the development of yellow spot disease have been described by Illingworth[2] as follows:—"The first appearance of the disease, the so-called "initial spot," is a slightly raised yellowish spot on the upper surface of the leaf. It varies in size from $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. When fully developed, the darker centre is surrounded by a halo of yellow (Plate 263, fig. A.). Ordinarily, only one leaf is affected, but as many as five initial spots have been found on a single

* Pineapple growers are requested to maintain a careful lookout for plants or fruit affected with disease symptoms resembling those described in this article. In particular, plantings made from tops should be kept under close observation. Plants or fruits suspected of being affected with yellow spot disease should be forwarded to the Department of Agriculture and Stock for examination in order that data may be obtained regarding the distribution of the disease in this State.

plant. When the spot makes its appearance it is 3 to 8 inches from the base of the leaf. This is due to continued basal growth during the fairly long incubation period. After infection takes place in the axillary region (white tissue) of the leaf, ten days to two weeks must elapse before the yellow spot is apparent. The rate of growth of the individual plant determines the distance up the leaf at which the initial spot appears. All the evidence goes to show that the insect infection takes place near the centre of the plant or top, since the initial spots appear on the leaves of the third or fourth whorls from the centre.

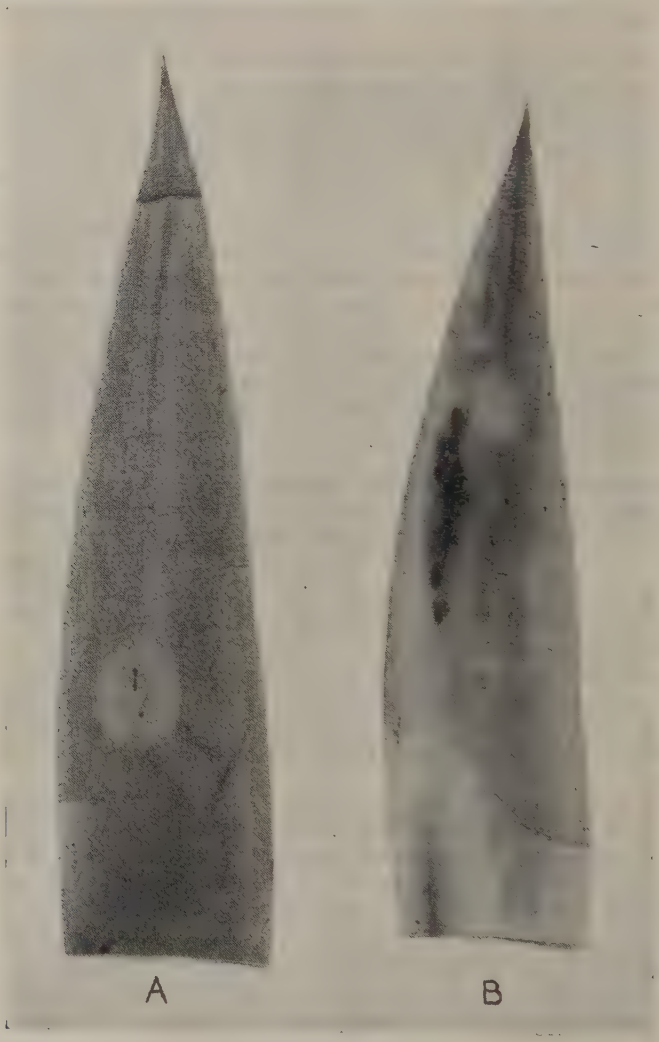

Plate 263.

Fig. A.—Early symptom (initial spot) of yellow spot disease on a leaf taken from an infected top. Note the characteristic halo.

Fig. B.—Yellow spot symptoms on a leaf produced above the "initial-spot" leaf. Note the typical chlorosis and the brown necrotic streak extending towards the base of the leaf.

"Under favourable conditions, a yellow streak develops directly below the initial spot, widening in the region of the white tissue at the base of the leaf. The tendency of this streak is to become constricted into circular yellow blotches, giving it the appearance of a chain of beads. These usually start an inch or more below the initial spot. After

Plate 264.

Yellow spot symptoms on a pineapple top. Note the chlorotic areas and the bending over of the central leaves towards the infection point.

a few days the portion of the streak in the white tissue at the base of the leaf has a water-soaked appearance. In the presence of moisture in the leaf axils, rot soon follows, extending to the stem. A few days later a yellow streak, developing into the characteristic bead-like chain,

can be observed extending up the next leaf above the one first affected. This usually spreads quickly to the other central leaves . . . . (Plate 263; fig. B.)

"At the point where the base of the young plant (or top) is affected, the tissue ceases to grow. The normal development of the healthy tissue on the opposite side soon causes the plant (or top and fruit) to bend over very decidedly (Plates 264 and 265). This led to the name 'side rot' first being used to designate the trouble."

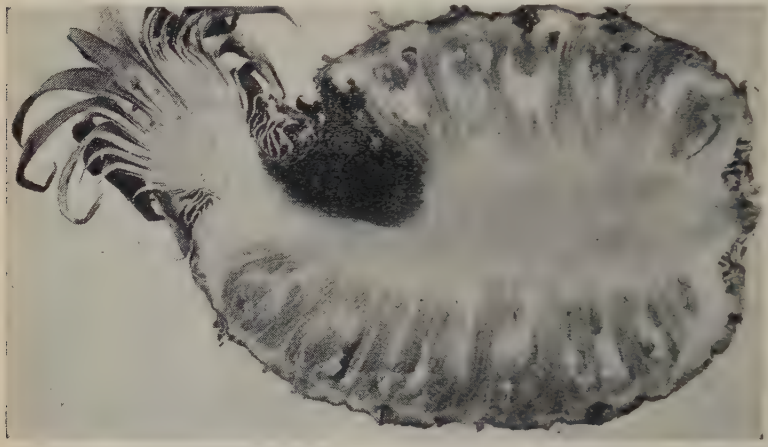

Fig. 2.

Fig. 1.

Plate 265.

Fig. 1.—A smooth Cayenne fruit affected with yellow spot. Note the characteristic lop-sided development of the fruit. Fig. 2.—Fig. 1 cut lengthwise to show the extent of the injury which the disease has caused in the fruit tissues. Note that the point of infection was at or near the base of the top.

If weather conditions remain favourable, a plant or top affected with yellow spot eventually rots and dies. Depending on the age of the plant, the succulence of its tissues and on seasonal conditions, this may take anywhere from two weeks to two months from the time the initial symptoms of the disease make their appearance. If tops become affected while they are still attached to the fruit, further progress of the disease may be arrested by cutting them off at the first appearance

of infection. If the causal agent of the disease invades the fruit, the tissues of the core and adjacent fruitlets break down and a brown rot develops.

Infection may also occur in a flower or young fruitlet in the same manner as in a young plant or the crown of a fruit.[6] This type of infection is usually confined to two or three adjoining "eyes" on one side of a fruit; in many cases only a single "eye" will be involved. Cessation of growth in the infected region results in an uneven rate of development on opposite sides of the fruit, causing it to bend over towards the point of infection. (Plate 265.) In the advanced stages of the disease, the affected tissues may dry out, leaving a cavity. The destruction of the diseased fruit tissues is frequently accelerated by saprophytic organisms such as species of *Penicillium*, *Fusarium*, and *Saccharomyces*. In Hawaii, this phase of the yellow spot disease is known as the "Kauai disease," since its symptoms bear a close resemblance to those recorded by Lyon for a disease of pineapple fruits which appeared on the island of Kauai in 1915.[4]

In Hawaii, heaviest losses from yellow spot disease occur in young plantings of tops (crowns), and also in fruit which have been rendered valueless through infection of their apical tissues from affected tops. Illingworth considered that the reason why plantings of crowns are more susceptible to yellow spot than those of slips or suckers was because the looser structure of the former affords the disease-transmitting insect easier access to the tender white tissue in the leaf axils where infection occurs. Other investigators, however, express the opinion that the greater susceptibility of young top plants to the disease is due to the comparatively greater succulence of their leaf tissues during the early stages of growth. In this connection it is interesting to note that while plants grown from tops—and to a lesser extent those grown from slips—are most susceptible between the ages of three and nine months, those grown from suckers are rarely affected with the disease at any stage of their growth.

The Role of *Thrips tabaci* L. in the Transmission of Yellow Spot.

Like bunchy top of banana, yellow spot of pineapples is a virus disease which is spread from plant to plant through the agency of an insect. As previously mentioned, the insect vector for yellow spot disease is *Thrips tabaci* L., commonly known as the onion thrips. This minute insect has a world-wide distribution, and is known to attack a wide range of both crop and weed plants. On the pineapple plant it causes mechanical injury to the white tissue at the base of the leaves, not only through feeding, but also by puncturing the epidermal layers with its ovipositor. However, the ill-effects arising from these injuries are negligible unless the insect inflicting them is infective with the yellow spot virus. In this latter case, the initial spot from which the disease takes its name will appear around or adjacent to the injury in about twelve days from the time the injury was inflicted. Ovipunctures occur as minute brown dots; they do not always occur within the yellow spot itself, and generally there are none at the centre of the spot. On the other hand, a feeding injury usually extends as an irregular brown line directly through the centre of an initial spot.

Linford,[3] who has made a very thorough study of the transmission of the pineapple yellow spot virus by *Thrips tabaci*, has found that the insect transmits the virus to and recovers it from several other plants in addition to the pineapple. The most important of these,

because of its wide distribution and the fact that it is a favoured host of *Thrips tabaci,* is the weed known as *Emilia sagittata.* On this plant the disease produces symptoms which involve, in addition to mottling, a distinct tendency towards ring spot, with zonate, circular, chlorotic patterns strongly suggestive of the disease as it occurs in the pineapple. A species of *Emilia* closely related to the one which occurs in Hawaii, as well as other weed hosts of the virus, notably *Sonchus oleraceus,* the sow thistle, are widely distributed in the pineapple districts of Southern Queensland, and this considerably complicates the problem of control in these areas. Up to the present, however, symptoms suggestive of yellow spot disease have not been found on any of the plants, other than the pineapple, which have been recorded as hosts of the virus in Hawaii.

The yellow spot disease may be transmitted from plant to plant through the agency of a single insect; the larger the number of infective individuals, however, the greater is the number of plants or fruits which are likely to become infected. All thrips which feed on a diseased plant may not become infective. Linford has shown that while larvæ become infective after feeding on a diseased plant and that while these individuals remain infective throughout their entire life cycle, thrips which feed on diseased plants for the first time during their adult stage never acquire the power to transmit the virus. Before a thrips larva can transmit the infection, however, approximately ten days must elapse from the time that it first fed on a diseased plant. This period closely approximates to the total duration of the larval stages of this insect.[5]

It is not yet known whether species of thrips other than *T. tabaci* may transmit the disease, but in Hawaii it is considered that this species is the chief vector, since it is the one most commonly observed on weed hosts of the virus.

Climate in Relation to the Occurrence of Yellow Spot Disease.

Climatic conditions play an important role in determining the severity of occurrence of yellow spot disease in pineapples. Even after the initial spot makes its appearance, further progress of the disease is influenced greatly by weather conditions. Humid conditions hasten the development of the disease, while prolonged dry weather retards it. In Hawaii the disease occurs chiefly during the winter and spring months, i.e., the rainy season.[2] New infections are rarely encountered during midsummer, but they usually begin to appear again in young plantings about December (early winter). Following the discovery of the disease on the island of Oahu in 1926, it spread gradually to other islands of the Hawaiian Group, the last island on which it made its appearance being Kauai, in 1930. At the present time the severity of the disease is much worse on this lastnamed island than on any of the others, and this appears to be related in part to the fact that climatic conditions on Kauai are considerably cooler and wetter than elsewhere in the group, due to its more northerly latitude. Next to the plantations on Kauai, those on the uplands of Oahu are affected worst. On Lanaii and Molokai, where the plantations are chiefly located in low-rainfall areas, the disease is of little consequence.

Insufficient data is available to indicate the probable effect of Queensland climatic conditions on the seasonal incidence of the disease, or the extent to which it may develop under these conditions. However, in view of the fact that spread of infection from the only outbreak

of yellow spot which has yet been recorded in this State appeared to have been arrested some time previous to the beginning of October, it seems likely that, as in Hawaii, development of the disease will be markedly retarded during prolonged dry periods.

Plate 266.

Control of yellow spot disease by removal of tops from maturing fruit. Photograph taken in Hawaii on the island of Kauai, June, 1936.

In Hawaii, a very definite relationship appears to exist between the incidence of yellow spot disease and the direction of prevailing winds.[2] Plantations situated on the leeward side of affected pine-apple fields or weed-infested areas are likely to suffer severely from the disease during their early stages of growth, particularly if tops are used as planting material.

Control Measures.

Complete eradication of yellow spot disease from an infected area does not seem to be a practical possibility, since some of its weed hosts are able to exist for long periods in a diseased condition and thus provide

continuous sources of infection. As Linford[3] says:—"Were it not for *Emilia* and other hosts of the virus, the pineapple yellow spot might be self-exterminating, since the pineapple plant affected with yellow spot soon dies. Consequently, transmission of the virus in diseased planting material within an infected region is not of serious importance and roguing is not needed as a control measure. Dead and dying plants are removed from fields simply to make space for replants. It is the movement of infective thrips from other hosts of the virus that accounts for the appearance of this disease in the pineapple."

Owing to the practical difficulties involved in controlling yellow spot by (*a*) elimination of the sources of infection or (*b*) destruction of the transmitting insect, reliance has to be placed on other methods of crop protection. It has been found that losses of young plants from this disease may be reduced to negligible proportions by planting only slips or suckers, while fruit losses may be avoided by cutting off infected tops as soon as the first symptoms of the disease appear in them. (Plate 266.) These are the only methods of control which are being employed in Hawaii at the present time.

Carter[1] has reported that it is possible to obtain a marked reduction in the incidence of the disease in young pineapple plants by frequent applications of tobacco dust. This reduction is believed to be due to changes induced in the plant as a result of the tobacco dust applications, since it was observed that these applications retarded and toughened the growth of very young plants. Since there appears to be a definite relationship between succulence of growth and susceptibility to yellow spot disease, Carter considers that retardation of growth is primarily responsible for the control achieved by tobacco dust applications. He points out, also, that if this conclusion is valid, then it must be remembered that a good many other factors might retard plant growth in the early stages with a similar effect on susceptibility. However, in view of the proved effectiveness of the simple measures already described, the use of tobacco dust for the control of yellow spot does not appear to be either necessary or economically justifiable at the present time.

With the discovery that *Thrips tabaci* was the transmitting agent of the yellow spot virus, the research organisation of the Hawaiian pineapple industry immediately gave attention to the problem of controlling the disease by biological means. Insect parasites of thrips have been introduced into Hawaii from a number of other countries, but as late as 1936 none of these had become established to an extent where they could be regarded as an appreciable factor in the control of yellow spot disease.

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Little Leaf of the Apple.

A PROGRESS REPORT.

R. B. MORWOOD, M.Sc., Research Officer.

A DISEASE of the apple referred to as little leaf or rosette was recorded from the Stanthorpe district in 1928. At that time only a few isolated trees were affected, but a few years later it had assumed serious proportions and has been spreading with ever-increasing rapidity. The symptoms correspond to those of the disease described as little leaf from the States of California and Washington in America and from South Africa. The response to zinc treatment reported below establishes the identity of the Queensland disease with that responding to similar treatment overseas.

Symptoms.

The symptoms of little leaf are most conspicuous in the spring, when abnormal growth develops from the top buds of one or more leaders. The development of small leaves and short internodes results in rosettes occupying the place of normal shoots. The colour of the foliage is considerably lighter than that of healthy leaves, and mottled chlorosis of fully developed leaves is frequently associated. Little leaf buds burst later than normal ones and only develop slowly, in fact the season's growth may be barely measurable in severe cases. In the early years of attack on a tree there occurs an apparent recovery with the second burst of growth which normally occurs in apples at Stanthorpe in December or January. At that time a bud below the terminal rosettes develops and grows strongly for the remainder of the growing season. If, however, the leader is cut to this growth at the following pruning, then it develops little leaf in the next season, and a continuation of this policy results in progressively weaker growth and shorter leaders. In severe cases growth practically ceases and a small misshapen tree bearing little or no fruit is the final result. Prior to the appearance of definite symptoms little leaf can sometimes be detected by the cessation of growth of leaders on otherwise vigorous trees.

Young or old trees appear equally liable to the disease, but it is most readily recognised on vigorously growing trees where marked differences between healthy and affected portions occur. On non-vigorous trees the normal small size of the leaves and shortness and thinness of internodes exists in all gradations, and in its extreme form is difficult to differentiate from little leaf.

At Stanthorpe little leaf is primarily a disease of apples, though similar symptoms have been observed in isolated cases on pears and plums. The disease has been observed on a wide range of varieties, on both Seedling and Northern Spy stocks. Observational evidence is accumulating to the effect that the Delicious is somewhat more subject than other varieties and that "reworked" trees are frequently the first affected in an orchard.

Experiments on Control.

Experiments on the control of the disease were commenced in April, 1934, when soil applications of iron, copper, and zinc were tried at rates of 2, 4, and 6 lb. per tree, and cover crops were planted. The crops

failed to become established owing to adverse climatic conditions, and no results could be deduced from the soil applications either in the following spring or that of the succeeding year.

In the spring of 1935 a number of zinc triangles varying from 10 to 40 per trunk and 5 per limb were driven into six trees, and three trees were sprayed with a zinc lime spray. Although the sprayed trees made better growth, no definite results could be recorded. The zinc triangles showed little or no effect in the immediate season or that following. In the third season they were associated with a considerable degree of recovery, but the failure to keep track of several check trees in the meantime and partial recovery of others has made definite conclusions from these trees impossible.

Fig. 1. Fig. 2. Fig. 3.

Plate 267.

Tip Injections.—Fig. 1. Injected distilled water. Fig. 2. Injected 2 mg. zinc sulphate. Fig. 3. Injected major nutrient elements.

Tip Injections.

In the spring of 1936 tip injection was used for diagnosing a response to zinc. After a preliminary trial with eosin, using also a zinc, and a nutrient solution, the following method was adopted. A spur about 12 inches below the tip of a severely affected leader on a small tree was cut across and connected with rubber tubing to the bottom end of a filtering tube. The tube was supported on a stick secured to the leader lower in the tree. Twenty millilitres of the solution under test were run into the tube and the air released from the rubber tubing.

The apparatus was left till the following day, by which time the solution was absorbed. Twelve leaders were injected in four groups of three, each of which received one of the following solutions:—

(A.)	Zinc sulphate	1 gram
	Distilled water	10 litres
(B.)	KNO_3	1 gram
	$MgSO_4$	0·5 „
	NaCl	0·5 „
	KH_2PO_4	0·3 „
	K_2HPO_4	0·27 „
	H_2O	10 litres
(C.)	Distilled water.	

Fig. 1.

Fig. 2.

Plate 268.

Little Leaf on Lalla Apple.—Fig. 1. Tree healthy after spraying with zinc-lime. Fig. 2. Unsprayed tree affected with little leaf.

Two months later a small but distinct response to the zinc treatment could be noticed. Buds which had produced only small rosettes were renewing growth on all four shoots injected with the zinc solution. In only two instances (one water and one nutrients) could any growth be detected from the other injected shoots, and this growth was smaller than that with zinc. In the spring of 1937 healthy vigorous growth was produced from two of the zinc injected shoots, the other two showing fair growth. All of the other injected shoots produced only small rosettes (Plate 267).

Spraying Experiments.

Following the initial indications of response to zinc injections, zinc sprays were again tried using an autumn application of 10 lb. zinc sulphate and 5 lb. hydrated lime to 100 gallons of water. An average of $\frac{4}{5}$ of a gallon per tree was applied to medium-sized trees. Each plot contained six Lalla and six Jonathan apple trees, and four replications of sprayed and unsprayed trees were used. The Lalla trees were seven years old and particularly vigorous, except that about half of the trees were showing early symptoms of little leaf. The Jonathans were less vigorous, and, in fact, some of them were making very little growth, and consequently little leaf was more difficult to determine with certainty and only a few of the trees were recorded as affected. The sprays were applied on the 1st April, 1937.

Fig. 1. Fig. 2. Fig. 3.

Plate 269.

LITTLE LEAF SPRAYING EXPERIMENT.—Fig. 1. Leader showing typical little leaf symptoms. Fig. 2 Healthy leader. Fig. 3. Leader which had little leaf in previous season showing recovery after spraying with zinc-lime. Note weak growth for previous year comparable with that of leader in Fig. 1.

Results.

The following spring growth showed obvious differences between sprayed and unsprayed plots in the rows of vigorous Lalla trees in which little leaf was evidently spreading (Plate 268). The sprayed trees were invariably making healthy growth, only portions of the trees most severely affected in the previous season not showing complete recovery (Plate 269). In the unsprayed plots, trees previously diseased showed more severe symptoms, and many trees previously healthy had developed

a considerable degree of little leaf. Counts were made of the number of leaders on each tree showing definite little leaf symptoms on the 15th October, 1937. The results in the Jonathan row were not so definite, but the figures suggest a degree of control from the use of zinc spray. In Table I. the average number of affected leaders per tree is given for each variety in each plot, and in Table II. the figures refer to trees grouped according to the severity of the disease in the previous season.

TABLE I.

Apple Little Leaf. Average Number of Affected Leaders per Tree.

Variety.	Treatment.	Block I.	Block II.	Block III.	Block IV.	Average.
Lalla	Sprayed	0	0·8	0	1·5	0·6
Lalla	Unsprayed	2·8	6·8	11·5	8·2	7·3*
Jonathan	Sprayed	0·7	0·2	0	0·3	0·3
Jonathan	Unsprayed	0·7	0·5	1	4	1·5

* Differs significantly from sprayed.

TABLE II.

Average Number of Affected Leaders on the Trees when the Latter are Grouped According to the Severity of the Disease before Spraying.

Variety	Treatment.	Severe.*		Moderate.		Slight.		Healthy.	
		Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.	Number of Trees.	Leaders affected per Tree.
Lalla ..	Sprayed	2	3	3	1·6	3	1·0	16	0
Lalla ..	Unsprayed	2	14	3	11·0	9	7·9	10	4·4
Jonathan ..	Sprayed	0	—	1	2	8	0·4	15	0·1
Jonathan ..	Unsprayed	0	—	0	—	3	0·6	21	1·8

* Extent of little leaf prior to spraying.

Discussion.

The results recorded can be supported by observations of trees where zinc sprays have been tried by orchardists, and the response to zinc treatment is considered to be definitely established. The best method for the application of zinc is still in doubt, as is also the period for which one application will protect the tree, and extensive experiments to elucidate these and other points are being carried out by Mr. K. M. Ward, Assistant Research Officer. In the meantime a consideration of the serious effect on the trees of even one year's delay in the application of control measures would warrant orchardists applying the method which has shown best commercial results to date. This is the application of a zinc lime spray to the trees when in full leaf. The zinc lime spray is made up by dissolving 8 lb. of commercial zinc sulphate in about 70 gallons of water and adding 4 lb. of hydrated lime dissolved in 4 gallons of water while stirring. The mixture is then made up to 80 gallons and is ready for use.

Acknowledgments.

In addition to the assistance received from other Departmental officers, it is desired to acknowledge facilities and help provided by Mr. W. Long, Glen Niven, and by the late Mr. and Mrs. A. H. Paget and Mr. W. Paget, the Summit.

Summary.

The symptoms of little leaf of the apple as it occurs in the Stanthorpe district are briefly described.

Affected trees show a beneficial response to zinc treatment.

Foliage spray with zinc lime 10–5–100 has given commercial control in one experiment.

GROW MORE PASSION FRUIT.

There is a very much greater demand for passion fruit, both locally and for export, than Queensland produces, and as this State grows a passion fruit of the very highest quality, it should be produced to a greater extent than it is. As an occupation on the orchard it is one of the most pleasant. Previously production of this fruit has been undertaken chiefly as a sideline only—a kind of secondary affair which, if it yielded a return, so much to the good; if it didn't, well, it did not matter a great deal. The ever-expanding demand warrants its being made a practical crop and being subjected to kind treatment.

Vines are prone to several diseases which, with proper attention, can be controlled, but which, when the vines are allowed to grow uncared for, quickly destroy them. Due to these diseases and the haphazard method of cultivation frequently employed in the past, the idea has become current among orchardists that vines can be grown only for about two, or at most three years. That this is erroneous is being demonstrated at the present time by vignerons who have made passion fruit growing their main occupation, and who have vines bearing well at seven years of age. These growers, however, prune correctly, and spray at the correct times as advised by the department. They also grade and pack their product for market, and the result is that they are reaping the benefit of an excellent monetary return.

It is stated by some that passion fruit growing entails too much work pruning and spraying, and that the results are not worth it. A careful analysis of the position will refute such statements. Pruning the vine undoubtedly is a tedious and lengthy operation. Spraying also is objectionable, but it should be remembered that citrus growers, grape growers, and practically all other fruit growers must also prune and spray their trees. So far as returns are concerned, good vines produce up to half a bushel of fruit per year. They are usually planted 15 feet by 8 feet apart, or 363 vines per acre. Prices vary from 22s. 6d. per half-bushel during the periods of scant supplies to 4s. 6d. per half-bushel paid by the local factories. From these figures orchardists can estimate for themselves the likely returns. On a conservative average of 3s. 6d. per half-bushel clear of marketing expenses, the return would be £63 per acre per annum. Are there many other fruit crops netting orchardists this sum per acre?

Briefly, for the guidance of those who may be considering planting, it should be remembered that the passion vine is a climber, and thrives in warm, moist situations, preferably in the coastal districts. It grows well on the coastal highlands, like the Blackall Range and Tamborine Mountain, and also on the lowlands between these and the sea. The vine will resist light frosts, but heavy frosts will cause damage.

Reasonable fertile scrub and forest loams, provided they are well drained, are suitable soils, and if a hillside site is chosen it should be well sheltered from heavy winds and preferably have an easterly or north-easterly aspect. It is important that the trellises be strongly made, and that they be at least 6 feet in height.

Two crops are borne each year, a summer and a winter crop, whilst occasionally intermediate crops are borne.

Spring is the best time to plant, though autumn planting is sometimes practised. Spring planted vines sometimes return a small crop the following winter, but the first main crop can be looked for twelve to fifteen months after planting. With autumn-planted vines the first main crop often is not obtained until eighteen to twenty-one months after planting.

A pamphlet giving full cultural details is available free on application to the Department of Agriculture.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

[*Continued from p. 596, Part 5, Vol. XLVIII.—November,* 1937.]

PART VI.

ANNUAL WINTER FODDER GRASSES.

Oats (*Avena* spp.).

Origin and Distribution.—The various types of oats are native to countries bordering the Mediterranean, but many of the varieties used in Queensland have originated in Australia from imported varieties. The Sunrise oat was selected from a field of Algerian oats (from Algeria) growing in Victoria, and Buddah, Mulga, and Belar oats are selections from Sunrise made in New South Wales. Oats are grown for grain, hay, and grazing in a large number of countries, and have been a favoured grazing and green feed crop in Queensland for many years.

Description.—The oat plant is a tufted, erect, annual plant in which the number of tillers and the nature of the stems, leaves, and seed-head vary with the variety.

Climatic Requirements.—Oats are a winter-growing crop, but by conservation of summer rainfall in the soil and by the use of selected varieties the crop can be grown in many areas with a fairly low winter rainfall.

Soils.—A wide range of cultivated soil types is suited to oat growing. Even fairly wet and sour soils will yield fair crops.

Planting.—Oats are best sown in the autumn, the actual time of sowing depending on weather and soil conditions, the variety to be grown, and the purpose for which the crop is sown. For hay, green fodder, and grazing purposes the late-maturing Algerian oat has in the past been the most popular oat in Queensland, but a range of equally good types is now available. The following are some of the recommended varieties:—

Algerian.—Because of its late-maturing habit, this variety is not quite suitable for dry districts. Where the winter and spring rainfall is satisfactory, Algerian is valuable for hay, green feed, or grazing. It recovers quickly after cutting or grazing, but the young growth is somewhat unpalatable to stock. Early autumn sowing is recommended. In habit it is high-tillering, strong-strawed, and narrow-leaved. It is very susceptible to smut and rust.

Sunrise.—This selection from Algerian oats is very suitable to Queensland conditions. It is particularly useful on the coast because of its resistance to rust. Sunrise is a good grazing oat, and is also valuable for hay and silage. When growing rank it is liable to lodge.

Mulga.—For grazing purposes Mulga is useful for producing an early green feed, but it does not recover well from grazing, and in addition has a short growing season. If a succession of sowings of oats is being made, a late autumn sowing of Mulga will provide a good deal of feed in early winter. It is susceptible to rust.

Belar.—This is a tall, early-maturing oat with wide leaves, and is a good hay and grazing variety. It recovers well after grazing.

Buddah.—This is a tall, sparsely-tillering variety producing a limited bulk of feed. It is not a good grazing variety.

When oats are sown for grazing purposes a sowing rate of 1 to 1½ bushels per acre is recommended. If the crop is to be cut for green feed and not grazed, ¼ to ½ bushel of field peas of the Dun, Grey, or Partridge varieties should be sown in conjunction with the oats to provide a richer feed.

Sowing through the grain drill, the seed being covered to a depth of 1½ to 2 inches, is the best method of planting. Some of the grain runs must be stopped up in order to sow at the required rate. If the seed is hand-broadcast, it should be scattered in the direction of the cultivator furrows and covered by a stroke of the harrows in the same direction.

Plate 270.
Cape Barley and Field Peas.

Management.—Oats sown for grazing should not be continuously grazed, but should be spelled after each grazing to permit of recovery.

Conservation.—A hay of excellent quality can be made from oats, which also furnish a good type of silage.

Feeding Value.—Oats provide very good grazing for milking cows, as well as for fattening stock, if fed in the young stage. Towards maturity the crop loses some of its nutritive value.

Pests and Diseases.—From the grazier's point of view rust is the most serious disease of oats. In some seasons the infestation is so heavy as to render the crop useless for grazing purposes.

Barley (*Hordeum* spp.).

Origin and Distribution.—The cultivated barleys probably originated in Eurasia, where they form a valuable grain crop, and they are grown in many temperate and sub-tropical countries for malting purposes, for hay, and for pasture. In Queensland there is only a limited area grown for grain, but several varieties are commonly sown for fodder.

Description.—The barley plant (Plate 270) is quite typical of the winter cereals, being an erect, tillering, leafy annual.

Climatic Requirements.—Barley is a winter and spring grower, and requires a moderate winter rainfall.

Soils.—Various soil types are suited to barley cultivation.

Planting.—Barley should be sown during the autumn months on well-prepared land, and preferably in conjunction with a legume. A mixture of ¾-1 bushel of barley and 20 lb. of field peas or vetches is recommended. Varieties of barley suited to the district should be used.

Management.—Several grazings may be made during the season or the crop allowed to reach a more mature condition and then cut for feeding green.

Feeding Value.—The palatability and feeding value of barley are good.

Wheat (*Triticum* spp.).

Origin and Distribution.—Wheat, the world's main cereal plant, probably originated in Eurasia, but most countries of the world now cultivate the crop, and the main growing countries have produced types most suitable to their particular conditions. In addition to its use as a grain, wheat is commonly sown for grazing, green feed, hay, and silage, and grain crops are often fed off in their early stages.

Description.—Wheat (Plate 271) is an annual with a fibrous root system. It tillers fairly freely, and the erect stems bear wide leaves.

Climatic Requirements.—All Australian wheat is grown during the winter and spring months. In Queensland selected varieties may be grown in all the agricultural districts, but the chief area growing wheat for grain and other purposes is the Darling Downs. In areas with a higher winter rainfall rust infection is usually high.

Soils.—Most agricultural soils are suitable for wheat.

Planting.—When planted for fodder purposes only, wheat is usually sown in admixture with a legume such as field pea or vetch. The sowing should be carried out during the autumn or winter months, and if desired successional sowings may be made by using a series of varieties. The rate of sowing is ¾-1 bushel per acre of wheat, together with 20 lb. of legume seed.

Management.—Fodder mixtures of wheat and legumes may be either grazed or cut for green fodder. The crop should be given ample time to recover between grazings.

It is a common practice in wheat-growing areas to graze, in the early stages, stands of wheat sown for grain purposes. The stock most usually employed are sheep or dairy cows, and the grazing is carried out either as a part of the normal farm routine or else to check dense rank growth following particularly favourable growing conditions. Three important points in management of this grazing are—

(1) Grazing should not be carried out when the soil is wet.

(2) Even grazing should be effected by grazing small areas for a short time.

(3) Stock should not be grazed on the crop after the production of flowering stems has commenced.

Plate 271.
Wheat and Tares.

Investigations carried out in Victoria demonstrated that grazing should be stopped immediately the first joint of the main stems produced in early spring come within reach of the animals' bite, for it is in the region of the first joint that the miniature flower head lies.

Conservation.—Wheaten hay is one of the most valuable cereal hays, and the crop is also very suitable for ensiling. The grain and offal are valuable stock foods.

Feeding Value.—The young growth of wheat is of high feeding value, and is relished by all classes of stock. The green crop is a useful feed if cut before maturity.

Pests and Diseases.—Stem and leaf rusts are common on many varieties of wheat in some seasons, and reduce the feeding value of the crop.

Rye (*Secale cereale* L.).

Origin and Distribution.—Rye is a native of Europe and Asia, where it is widely grown for its grain. In most temperate countries it is grown to some extent for grazing or green feed, but its use in Australia for these purposes is slight.

Description.—Though resembling the other annual winter cereals in habit, rye has somewhat longer stems and a more extensive root system.

Climatic Requirements.—Rye is able to thrive in cooler and drier climates than the other winter cereals. Its ability to do well under dry conditions is probably due to its root system.

Soils.—Whilst rye does well on the chief agricultural soils, it is also able to thrive on poor and sandy soils. Its adaptation to such soils has been ascribed to its deep and widely-spreading root system.

Planting.—Rye is sown similarly to other winter cereals, but should be planted early. Between 1 and 1½ bushels per acre is sufficient to sow if 20 lb. of vetch or field pea is sown in admixture.

Management.—As a pasture plant, rye is very satisfactory. It produces early winter feed, and can be grazed quite heavily.

Conservation.—Rye is occasionally used for hay and silage.

Feeding Value.—The feeding value of rye approximates that of other small grain crops.

* Seed Canary Grass (*Phalaris canariensis* L.).

Origin and Distribution.—The grass which furnishes the canary seed of commerce is a native of the Mediterranean region. It is fairly widely cultivated in warm, temperate countries for seed purposes, and is used in Queensland both for grain and for grazing.

Description.—Seed canary grass is an annual tufted grass with very soft leaves and a fairly shallow root system. The stems are erect and bear short, ovoid seedheads with a dense formation of flowers. The seed is light yellow in colour, hard and shining.

Climatic Requirements.—Being a winter and spring-growing annual, seed canary grass requires a winter rainfall for its best development. Once established, it is fairly drought resistant, and the climatic conditions of our main wheat-growing areas are quite suitable for its cultivation.

Soils.—The grass requires a fertile soil, such as the basaltic soils of the Darling Downs.

Planting.—The best time for sowing is during May, but sowings may be made up to the end of September. If the seed is drilled in, 8 lb. per acre is sufficient.

Management.—The crop can be grazed once or twice before permitting it to go to seed, or it may be reserved for grazing purposes. The grass is inclined to pull out by the roots if grazed too early. It should not be eaten down too closely.

Conservation.—A good quality hay can be made from seed canary grass, but other cereal hays are preferable.

Feeding Value.—The nutritive value of the grass is very good.

* A special leaflet on the cultivation of canary seed is obtainable from the Department of Agriculture and Stock.

Italian Rye Grass (*Lolium multiflorum* Lam.).

Origin and Distribution.—Italian ryegrass is a native of Europe now grown extensively in many temperate countries, including England, United States of America, and New Zealand. In Australia it is used in the Southern States for winter grazing, and is coming into favour in Southern Queensland for the same purpose (Plate 272).

Plate 272.
Italian Rye Grass in the Caboolture District.

Description.—Though occasionally biennial in habit, in Queensland Italian ryegrass usually lives for only one season. It is a tufted, soft, leafy plant, tillering freely and reaching a height of about 18 in. The seeds are borne closely pressed against the slender flower stem.

Climatic Requirements.—A fairly moist winter and spring growing period is necessary for good development of Italian ryegrass. Such conditions are found only in the south-eastern part of the State, and even there not in all years. Frosts do not injure the grass, but long dry periods, particularly during the spring, give the pasture a severe set-back.

Soils.—Italian ryegrass prefers a well-drained, fertile soil, and should not be sown on inferior soil types.

Planting.—The grass should be sown in early autumn (i.e., late March or April), though sowings during May and June may be made if circumstances do not permit of earlier planting and spring feed is desired. Some farmers make a practice of scattering a few pounds of seed of the grass between the rows of the maturing maize crop at the time of final scuffling (Plate 273). The grass develops in the shelter of the crop, and when the cobs have been stripped an excellent pasture is available for grazing by stock. Most commercial lines of Italian ryegrass seed are of excellent germinating capacity and purity. The seed of Italian ryegrass is fine, and a good seedbed is desirable. Only a light covering should be made. Since the grass is an annual, only annual

winter-growing legumes or grasses should be sown in conjunction with it. Berseem clover is a good legume to use in the higher rainfall districts. Red clover makes later growth, but balances the pasture in the spring. Vetches and tares are occasionally used. The ryegrass should be sown at the rate of 15 lb. to 20 lb. per acre, with lighter sowings of the legumes (about 5 lb. of Berseem clover or 4 lb. red clover or 10 lb. vetches). Wimmera ryegrass may be substituted for portion of the Italian ryegrass in order to ensure some grazing should rainfall conditions prove just a little too severe for the latter.

Plate 273.
Italian Rye Grass in a Maize Crop.

Management.—Italian ryegrass is well adapted to grazing, but should be grazed intermittently in order to obtain best results. In favourable seasons feed will be available within eight weeks of sowing, and grazings may be made until the pasture dies off in late November or early December. The grass makes a quick recovery after grazing. Italian ryegrass sets abundant seed, and in some years seeds itself down quite effectively if the stock are removed while the seed is ripening and shedding. However, it is inadvisable to rely on self-regeneration, and provision should be made to sow the pasture afresh each year.

Conservation.—An excellent hay may be made from Italian ryegrass, and it also makes good silage if cut when some of its extreme succulency has been lost.

Feeding Value.—On account of its high proportion of nutritious leaf to stem Italian ryegrass is of excellent feeding value and palatability. It is a good fattening grass and an excellent cream producer.

Pests and Diseases.—Italian ryegrass is rather susceptible to rust attack in certain localities.

ANNUAL WINTER-GROWING FODDER LEGUMES, &c.

Field Pea (*Pisum sativum* L.).

Origin and Distribution.—The field pea is a native of Europe, fairly commonly used in many temperate countries for grazing, green feed, and green manuring purposes. In Southern Queensland it is a favourite winter green fodder crop, either alone or in combination with a winter cereal.

Description.—The plants are annual herbaceous trailers, or climbers, with hollow stems. The leaves are feather-like and bear tendrils. The flowers are reddish or purplish, and occur in groups on flower stems at the bases of the leaves. The pods contain angular, greyish seeds.

Climatic Requirements.—The field pea is a winter grower, and does best in cool, moist climates.

Soils.—Fertile soils are necessary, and they must be well drained.

Planting.—Field peas are often injured by the tramping of stock, and so are most useful for grazing purposes when sown with one of the winter cereals. About 20 lb. per acre is sufficient for sowing in mixtures. The crop should be sown in autumn.

Management.—If the mixed crop is to be grazed it should be carefully managed to avoid undue loss. Quick grazings should be made, and stock should be excluded in wet weather.

Often the mixture is cut for green feed, and this practice is usually preferable to grazing.

Bloating of stock may occur if proper care is not taken.

Feeding Value.—Field peas are very palatable to stock, and have a high feeding value.

Vetches and Tares (*Vicia* spp.).

Origin and Distribution.—Of the various forms of cultivated vetch some are natives of Europe, some of Asia, and some of the United States of America. All occur in temperate and warm temperate areas, and in these and similar areas of the world the vetches are commonly cultivated for hay, grazing, green feed, or green manure.

Description.—The vetches are climbing or trailing succulent annual plants with much divided leaves and blue, violet, or white flowers occurring in groups in the axils of the leaves. The pods are flat and contain seeds of a colour varying with the variety.

Climatic Requirements.—Vetches are winter-growing plants, and will make a fair crop on even a rather low winter rainfall. They are affected by hot weather, and die off in early summer.

Soils.—Most agricultural soils are suitable for vetches.

Planting.—Whilst they can be grown alone, vetches are better sown with some upright crop, such as one of the cereals. The mixture is much easier to harvest than the tangled mat of green stuff resulting from an unmixed sowing. In mixtures it is usual to make the cereal the main component and to sow only about 20 lb. of vetch seed in the mixture. Sowing should be carried out in early autumn.

Management.—Mixtures containing vetches may be grazed without much damage to the legume, though it is preferable to cut the fodder and feed it green to stock. When grazed, bloating should be avoided.

Conservation.—Vetches make a good quality hay if cut when in bloom or when the pods are forming, and they may also be ensiled.

Feeding Value.—The palatability and feeding value of vetches are very high.

Berseem Clover (*Trifolium alexandrinum* L.).

Origin and Distribution.—Probably this clover is a native of the Mediterranean region. It is now fairly extensively cultivated in Mediterranean countries, India, and certain parts of the United States of America and other warm-temperate to subtropical countries. In Australia it is used to some extent in the Southern States, and within recent years has come into prominence on the north coast of New South Wales. Sporadic attempts to cultivate the clover have been made in Southern Queensland without marked success, but in view of its usefulness in New South Wales, perseverance is advisable.

Description.—Berseem clover is a tufted, erect-growing annual clover somewhat resembling lucerne in appearance. The stems and leaves are very succulent. The globular flowering heads are borne at the ends of the stems and are yellowish-white in colour.

Climatic Requirements.—Since Berseem clover is an autumn and winter-growing annual, it is necessary for the clover to obtain a fair amount of moisture during the period March to August. Where the normal winter rainfall is less than 12 in. the clover should be planted only on irrigated land or on very retentive soils.

Soils.—In New South Wales the clover is reported to prefer deep clay and clay loam soils on river flats and to be somewhat less successful on red scrub volcanic soils.

Planting.—In most countries where Berseem clover is grown, it is used for hay or for cutting and feeding green. The main objection to its use for grazing is that much waste occurs owing to the trampling of the succulent parts by stock. If it is sown in pasture mixtures this objection is overcome to a large extent. A seeding rate of 8-10 lb. per acre is recommended when the clover is sown alone. In winter pasture mixtures 4-5 lb. per acre should suffice to provide useful winter grazing. Much of the Berseem clover seed on the market is imported from overseas, and frequently contains seeds of noxious weeds. Seed purchases should be submitted to the Department of Agriculture and Stock for examination, before sowing. The seed is of fairly high germinating capacity, and samples germinating lower than 65 per cent. are undesirable.

Sowing of Berseem clover should be carried out in late summer if valuable autumn and winter feed is to be obtained. Early March is, perhaps, the best time. Late autumn sowings do not permit the clover sufficient time to develop properly. Superphosphate sown with the seed will encourage the growth of the plants.

Management.—If the clover is not cut, but is grazed by stock, excessive trampling, with its consequent wastage, must be avoided by grazing off in a very few days and allowing ample time for recovery. The clover is very liable to bloat cattle. Since the clover does not regenerate itself from seed, there is no necessity to provide for seed ripening.

Conservation.—Berseem clover is reported to make excellent hay, but on the coast silage is more suitable. Mixtures of Berseem clover and oats or grasses are said to form good silage.

Feeding Value.—Palatability and feeding value are good.

Rape (*Brassica napus* L.).

Origin and Distribution.—Rape is a native of the Mediterranean region, and is used in many temperate and warm-temperate countries as an annual grazing crop for pigs, sheep, and dairy cows. It is used to only a small extent in Queensland.

Description.—The plant is naturally biennial in habit, but is usually treated as annual. It grows to a height of 2 to 3 ft., and consists for the most part of fleshy leaves.

Climatic Requirements.—Rape is most suitable for cool districts, and requires a winter rainfall for its development. Hot, dry, spring weather kills a good deal of the stand.

Soils.—A well-drained, fertile soil is required by the rape plant, and loams and sandy loams are the most suitable soil types.

Planting.—Rape seed should be sown in the early autumn on a well-prepared seed-bed. If broadcast, 4 lb. of seed should suffice for an acre. The seed should be only lightly covered.

Management.—The crop should be a foot or more tall before the stock are first put on to it to graze. When the plants have been eaten down fairly closely the stock should be removed and the crop permitted to make new growth. The succulent growth has a tendency to bloat ruminants, and appropriate precautions should be taken.

Conservation.—Rape is not a suitable crop for conservation purposes.

Feeding Value.—The succulency of rape renders it very palatable to stock. The plant has a high feeding value, especially for fattening purposes.

Pests.—Rape is rather susceptible to attack by insect pests, particularly a stem-borer and aphis or green-fly. These insects commonly destroy the whole crop, and for this reason rape is a somewhat unreliable crop to sow.

Special Feature.—Rape is sometimes used for green manure purposes.

Undesirable Features.—In addition to its bloating propensities, rape has a tendency to cause stock to scour rather badly.

CHECK LISTS OF COMMON AND SCIENTIFIC NAMES.

Within recent years important preliminary steps have been taken towards eliminating the confusion which has long existed in the nomenclature of grasses and other pasture plants. A revision of the scientific classification of British Empire grasses is in progress, and when completed will be of great benefit to those concerned with botanical names.

Similarly, a list of common names which will be accepted by the various agricultural authorities within the Commonwealth is in course of preparation, and farmers and pastoralists will assist in this movement towards uniformity if they adopt the names chosen as standard. Though the list of standard names has not yet been finalised, it is anticipated that those names used throughout the foregoing descriptions of pasture species will be accepted.

The following check lists include only the species dealt with in this series of articles:—

LIST OF GRASSES, &c., BY SCIENTIFIC NAME.

Scientific Name.	Common Name.
Grasses.	
Brachiaria mutica Stapf. (Syn. *Panicum muticum* Forsk.; *P. barbinode* Trin.)	Para grass, giant couch, panicum, Panicum muticum, Bancroft grass.
Bromus unioloides H. B. et K.	Prairie grass.
Cenchrus ciliaris L. (Syn. *Pennisetum ciliare* Link; *P. cenchroides* Rich.)	Buffel grass.
Chloris distichophylla Lag.	Tassell grass, frost-resistant Rhodes grass, winter-growing Rhodes grass, evergreen chloris.
Chloris gayana Kunth.	Rhodes grass.
Cynodon dactylon Pers.	Couch grass, Indian couch, Bermuda grass (U.S.A.), Doub grass (India).
Cynodon plectostachyum Pilg.	African star grass, budgee grass.
Dactylis glomerata L.	Cocksfoot, orchard grass (U.S.A.).
Digitaria didactyla Willd. (Syn. *Panicum didactylum* Kunth.)	Blue couch grass.
Digitaria spp.	Woolly finger and other African finger grasses.
Lolium multiflorum Lam. (Syn. *L. italicum* R. Br.)	Italian rye grass.
Lolium perenne L.	Perennial rye grass.
Lolium (?) *subulatum* Vis.	Wimmera rye grass.
Melinis minutiflora Beauv.	Molasses grass, Wynne grass.
Panicum antidotale Retz.	Giant panic grass, blue panic grass.
Panicum maximum Jacq.	Guinea grass, green panic grass.
Paspalum dilatatum Poir.	Paspalum, golden crown grass, Dallis grass (U.S.A.).
Paspalum distichum L.	Water couch, swamp couch.
Pennisetum clandestinum Hochst. ..	Kikuyu grass.
Pennisetum purpureum Schum. ..	Elephant grass, Napier fodder.
Phalaris canariensis L.	Seed canary grass, canary seed.
Phalaris tuberosa L.	Phalaris, Toowoomba canary grass.
Sorghum sudanense Stapf.	Sudan grass.
Legumes.	
Arachis hypogæa L.	Peanut.
Lespedeza sericea Mig.	Perennial lespedeza.
Lespedeza stipulacea Maxim.	Korean lespedeza, Korean clover.
Lespedeza striata Hook. et Arn. ..	Lespedeza, common lespedeza, Japanese clover.
Medicago denticulata Willd.	Burr medic, burr trefoil, burr clover, native trefoil.
Medicago lupulina L.	Black medic, English trefoil.
Medicago sativa L.	Lucerne, alfalfa.
Mucuna spp.	Velvet bean, Mauritius bean.
Stylosanthes sundaica Taub.	Townsville lucerne, wild lucerne.
Trifolium alexandrinum L.	Berseem clover, Egyptian clover.
Trifolium fragiferum L.	Strawberry clover.
Trifolium glomeratum L.	Clustered clover, ball clover.
Trifolium hybridum L.	Alsike clover.
Trifolium pratense L.	Red clover, cow grass.
Trifolium repens L.	White clover, white Dutch clover.
Trifolium subterraneum L.	Subterranean clover, "subclover."
Vigna unguiculata (L.) Wallp. (Syn. *V. sinensis* L.)	Cowpea, Poona pea.

LIST OF GRASSES, &c., BY COMMON NAME.

Common Name.	Scientific Name.
Grasses.	
African finger grasses	*Digitaria* spp.
African star grass	*Cynodon plectostachyum* Pilg.
Bancroft grass	*Brachiaria mutica* Stapf.
Bermuda grass (U.S.A.)	*Cynodon dactylon* Pers.
Blue couch grass	*Digitaria didactyla* Willd.
Blue panic grass	*Panicum antidotale* Retz.
Budgee grass	*Cynodon plectostachyum* Pilg.
Buffel grass	*Cenchrus ciliaris* L.
Canary seed	*Phalaris canariensis* L.
Cocksfoot	*Dactylis glomerata* L.
Couch grass	*Cynodon dactylon* Pers.
Dallis grass (U.S.A.)	*Paspalum dilatatum* Poir.
Doub grass (India)	*Cynodon dactylon* Pers.
Elephant grass	*Pennisetum purpureum* Schum.
Evergreen chloris	*Chloris distichophylla* Lag.
Frost-resistant Rhodes grass	*Chloris distichophylla* Lag.
Giant couch grass	*Brachiaria mutica* Stapf.
Giant panic grass	*Panicum antidotale* Retz.
Golden crown grass	*Paspalum dilatatum* Poir.
Green panic grass	*Panicum maximum* Jacq.
Guinea grass	*Panicum maximum* Jacq.
Indian couch	*Cynodon dactylon* Pers.
Italian rye grass	*Lolium multiflorum* Lam.
Kikuyu grass	*Pennisetum clandestinum* Hochst.
Molasses grass	*Melinis minutiflora* Beauv.
Napier fodder	*Pennisetum purpureum* Schum.
Orchard grass (U.S.A.)	*Dactylis glomerata* L.
Panicum (North Queensland)	*Brachiaria mutica* Stapf.
Panicum muticum	*Brachiaria mutica* Stapf.
Para grass	*Brachiaria mutica* Stapf.
Paspalum	*Paspalum dilatatum* Poir.
Perennial rye grass	*Lolium perenne* L.
Phalaris	*Phalaris tuberosa* L.
Prairie grass	*Bromus unioloides* H. B. et K.
Rhodes grass	*Chloris gayana* Kunth.
Seed canary grass	*Phalaris canariensis* L.
Sudan grass	*Sorghum sudanense* Stapf.
Swamp couch	*Paspalum distichum* L.
Tassel grass	*Chloris distichophylla* Lag.
Toowoomba canary grass	*Phalaris tuberosa* L.
Water couch	*Paspalum distichum* L.
Wimmera rye grass	*Lolium* (?) *subulatum* Vis.
Winter-growing Rhodes grass	*Chloris distichophylla* Lag.
Woolly finger grass	*Digitaria pentzii* Stent.
Wynne grass (Jamaica)	*Melinis minutiflora* Beauv.
Legumes.	
Alfalfa	*Medicago sativa* L.
Alsike clover	*Trifolium hybridum* L.
Ball clover	*Trifolium glomeratum* L.
Berseem clover	*Trifolium alexandrinum* L.
Black medic	*Medicago lupulina* L.
Burr clover	*Medicago denticulata* Willd.
Burr medic	*Medicago denticulata* Willd.
Burr trefoil	*Medicago denticulata* Willd.
Clustered clover	*Trifolium glomeratum* L.
Common lespedeza	*Lespedeza striata* Hook. et Arn.
Cowgrass	*Trifolium pratense* L.
Cowpea	*Vigna unguiculata* (L.) Wallp.
Egyptian clover	*Trifolium alexandrinum* L.
English trefoil	*Medicago lupulina* L.
Japanese clover	*Lespedeza striata* Hook. et Arn.
Korean lespedeza	*Lespedeza stipulacea* Maxim.
Lespedeza	*Lespedeza striata* Hook. et Arn.

LIST OF GRASSES, &c., BY COMMON NAME—*continued.*

LEGUMES.—*continued.*

COMMON NAME.	SCIENTIFIC NAME.
Lucerne	*Medicago sativa* L.
Mauritius bean	*Mucuna* sp.
Native trefoil	*Medicago denticulata* Willd.
Peanut	*Arachis hypogæa* L.
Perennial lespedeza	*Lespedeza sericea* Mig.
Poona pea	*Vigna unguiculata* (L.) Wallp.
Red clover	*Trifolium pratense* L.
Strawberry clover	*Trifolium fragiferum* L.
Subclover	*Trifolium subterraneum* L.
Subterranean clover	*Trifolium subterraneum* L.
Townsville lucerne	*Stylosanthes sundaica* Taub.
Velvet bean	*Mucuna* spp.
Wild lucerne	*Stylosanthes sundaica* Taub.

[CONCLUDED.]

KILLING JOHNSON GRASS.

Mr. W. J. McBaron (Corinda) writes in reference to an article on Johnson grass which appeared in a recent issue of the *Queensland Agricultural Journal*, in which it was stated that if the tops of the grass are kept from shooting by mowing it will be destroyed. Mr. McBaron states that he has seen the soil dug in a trench 3 feet deep, and the soil taken in a face to remove the roots; and, although there were no signs of leaves afterwards, it shot up round the treated area two years after. He also has seen the expedient of building a haystack over a clump of the grass tried, without success, inasmuch as the grass came up round and through the edge of the stack, eighteen months or two years afterwards. In the case of very heavy soil it is possible to kill the grass by ordinary methods.

Mr. McBaron states that, after a good deal of experimenting, he found only one method of combating the pest, and that was by using sodium chlorate as a spray. The destruction of the grass through this medium, however, was thorough and complete, there being not a vestige of either tops, stems, or roots—more correctly, rhizomes—remaining unpoisoned. Mr. McBaron said he had had several inquiries from persons who had seen the effectiveness of that method which he had tried when on a lucerne farm at Harrisville.

Describing this process, Mr. McBaron said two or three sprayings are needed, and from five to six months are required to kill the grass. The sodium chlorate is non-poisonous; but it has been found that clothing which has been wetted by a solution of it will burn like gunpowder when dry, and it is impossible to put it out. The clothes are safe while they remain wet.

One pound of sodium chlorate should be used to one gallon of soft water to which has been added some soap-powder, and this spray should be applied when the grass is old and in head. It is necessary that these three conditions should be observed in order to make the spray adhere thoroughly to the leaves. Spraying should be commenced as soon after Christmas as possible. If it is begun earlier than that the grass will be too vigorous, and if it started much later, there will not be time to finish the "job" before all growth is stopped by the winter. The only effects noticeable after this first spraying will be a slight withering of the leaves and a stooling out from the base. This growth must be caught with the second spraying as it comes to head; and, in a few weeks, all the roots will begin to die back, commencing with the points and the destruction of all the eyes along the roots. If the plants are let alone, it will be found that by the spring the parent stool will be dead and all the roots dried up. As a rule, no third spraying will be needed, except for the odd pieces which always are missed. Care must be taken not to overlook any of these, as otherwise all that has been done will be useless. If it is only a small patch on which the Johnson grass is growing, the seed heads should be reaped as soon as they have formed; but, if this is not done, care should be taken not to let any seedling grass get a hold in the following spring. Ordinary cultivation will kill the seedlings, as in the case of other grasses, if dealt with at an early stage.

A New Weed on the Darling Downs.

W. D. FRANCIS, Botanist.

WITHIN the last few months a new weed of the legume family has appeared on the Darling Downs in a lucerne field at Kingsthorpe. This weed has been determined botanically as *Astragalus hamosus*. This is the first record of the occurrence of a species of *Astragalus* in Queensland. The genus *Astragalus* is an extraordinarily large one, comprising over 600 different kinds or species. These species occur in different parts of the world such as Eastern Asia, Europe and North America. Among these numerous species are some notorious poisonous plants such as several of the loco weeds of North America. Wholesome species also exist. A Caucasian species (*Astragalus falcatus*) has been recommended in France in preference to lucerne for cultivation on poor dry lands.

When the specimens from the Darling Downs were provisionally determined as *Astragalus hamosus* some of them were sent to Mr. Anderson, Curator of the National Herbarium of New South Wales, for confirmation and remarks. A reply was received to the effect that this species was already established in parts of New South Wales and was spreading slowly, but that it had not so far been considered as poisonous to stock. In connection with the possible poisonous properties of this plant, it should be noted that Pammel lists it as poisonous on the authority of Greshoff, but he does not mention anything concerning its poisonous action or properties. I understand that the Veterinary Adviser of this State is taking steps to test the species for poisonous properties.

The species is indigenous to the Mediterranean Region and Transcaucasia.

Astragalus hamosus.—Usually in this plant there are a large number of reclining and partly erect stems proceeding from a common root-stock. In our specimens there are more than ten of these stems. Each stem measures from 7-10 inches long. With the possible exception of the petals and some of the inner parts of the flowers, all of the parts of the plant above ground are clothed with white hairs which are pressed to the parts on which they occur. These hairs often impart a greyish look to the plant. The leaves consist of 8-12 pairs of leaflets and a terminal odd leaflet. Each leaflet has the appearance of a small leaf. The leaves are placed alternately on the stem. Each leaflet measures from ¼-½ inch long and is elongate egg-shaped in outline with the apex blunt and broader than the base. The flowers are small and yellowish white in colour; they are borne in groups at the end of stalks which are situated at the junction of the leaves with the stem. These flower stalks vary from about ¾ in to 2 inches in length. The pods follow the flowers. The pods are strongly curved or prominently sickle-shaped; they measure from 1 to 1½ inches in length and are about ⅛ inch in thickness. A peculiar feature of the pods is a partition running their whole length and dividing the internal part into two cavities. The

Plate 274.

A new weed on the Darling Downs, *Astragalus hamosus.* The inset scale measures one inch. Photograph from dried specimen.

[*Photo. Dept. Agriculture and Stock.*

seeds are contained in these two cavities. Each seed is smooth, peculiarly geometric (almost rhombic) in shape, and measures about $\frac{1}{10}$ inch in length.

The accompanying photograph (Plate 274) illustrates a dried specimen of the plant.

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Pammel. Manual of Poisonous Plants, p. 829, 1911.

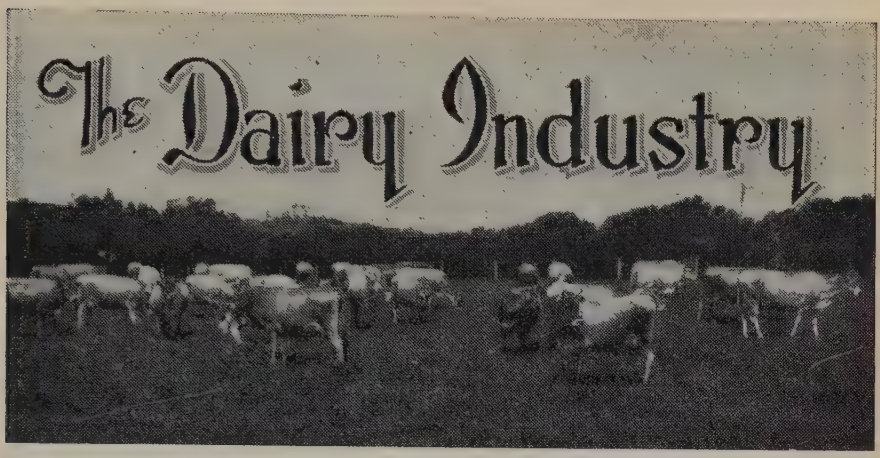
THE TAXPAYER AND THE PUBLIC SERVANT.

Many people think that the pay of every public official comes out of the purse of the taxpayer. Those people think wrongly. Many officials do not draw one penny of their pay from consolidated revenue, and are just as independent of that fund for their daily bread as are the outside taxpayers themselves. These officials, too, are not exempt from taxation which employees not in the service have to pay. Indeed, in many ways, Crown employees are much easier marks for taxation, and for the collection of taxes, than other employees. Various State Departments earn their own livelihood—some of them a good deal more; and the excess earnings go to help State activities—the education of the children of the taxpayer or the financing of loans for buildings and development. Demonstrating the contention, the State Insurance Office was established in 1916. In December, 1916, it employed forty-eight officers; its income for the year 1916-1917 was £202,569. As at 30th June, 1937, it employed 475 officers, its income for 1936-1937 was £1,406,743, and its total assets amounted to over £5,000,000. With the exception of the Workers' Compensation section, the State office, in a general way, is in open competition with public insurance companies, and has to fight and to fend for itself. It owns the well-known central building which is the hub of its operations. Thus, by keen and vigorous management and high efficiency, the State office has won for itself an honourable place in the world of insurance. It is apparent, too, that State Insurance supplied something which the public desired and has appreciated, otherwise the public would not have supported the office to the extent which it has done. And the staff and the general running expenses of this office are no more a charge upon the taxpayer than are the staff and the running expenses of, say, the A.M.P. Society. Comment on the same lines, but adapted to suit their special purposes, could be made of such self-supporting trust sections as the Public Curator's Office, State Advances Corporation (Workers' Dwellings), and the Agricultural Bank.

Employees paid from consolidated revenue numbered 27,979 at 30th June, 1937. Of these, 16,276 were engaged in providing railway service in return for fares and freights, and 750 were employed in sections which pay their way, such as the Titles Office, Machinery and Scaffolding Inspection, Government Printing Office. The remaining number of employees is 10,953, of whom 50 per cent. are in the teaching service and 25 per cent. are in the Department of Health and Home Affairs, which embraces police, prisons, asylums, and the general social services. The total annual cost of these two Departments alone exceeds the total income tax collections by nearly £500,000.

Seekers of truth may welcome these rays of light.

—J. D. Story, I.S.O., Public Service Commissioner, in his Annual Report to Parliament.



The Influence of Herd Testing.

L. A. BURGESS, A.A.C.I., Dairy Research Laboratory.

HERD testing is intended primarily to demonstrate to the dairy farmer the fat-producing capacity of each member of his herd. It also is of great benefit in improving the general standard of farm management. Experience has proved that better breeding requires better feeding, and an improvement in the quality of the dairy herds stimulates improvement in methods of pasture management.

New Zealand herd testing organisations have as an objective an average annual production of 300 lb. of butter fat per cow. In the Buller district of the Dominion, at least 40 per cent. of the cow population has been under test continuously since 1930. Since that year the following averages have been recorded:—

Year.	Fat per cow. Lb.
1930	230
1931	250
1932	279
1933	287
1934	297
1935	301

The Buller District Herd Testing Association has now fixed its objective at 350 lb. of fat per cow.

In the whole of New Zealand the average production per cow rose from only 127 lb. to 152 lb. between 1901 and 1919. The practice of herd testing then became more general, and in the shorter period 1920 to 1934 the average production rose from 152 to 220 lb. of fat.

In 1934, no fewer than 286,889 cows were tested for a period of 100 days or over, and their average production was 262 lb. of fat. The 1933-34 Queensland figures—29,521 cows, with an average production of 161 lb. of fat per cow—form a remarkable comparison.

Plate 275.
BURRADALE BYRON, the 1937 Brisbane Show Champion Australian Illawarra Shorthorn bull; owned by J. Phillips.

Plate 276.
MAY IV. OF OAKVILLE, the A.I.S. champion cow at the 1937 Brisbane Show; the property of G. M. Marquardt.

Plate 277.

Oxford Brown Victory, Champion Jersey bull at the last Brisbane Show, owned by Mrs. M. E. Stanton.

Plate 278.

Oxford Joyful Maid, Champion Jersey cow at the last Brisbane Show; owned by E. Burton and Sons.

With the increase in production per cow came the problem of providing additional food. This was not done by bringing large areas of new land into production, but by improving pasture management. Close subdivision of paddocks, laying down of pastures of improved grasses, conservation of fodder, and the wise use of artificial fertilizers improved greatly the carrying capacity of the land. It has been stated authoritatively that the greater part of the 5,000,000 acres of dairying land in the Dominion is top dressed at least once in every three years. The Dairy Industry Commission's Report of 1934 shows that the liberal use of fertilizers goes regularly with an increased production and carrying capacity per acre, and a decreased overhead in the cost of fertilizer per lb. of fat.

Pounds of butterfat per acre.	Total fertilizer expenditure per acre.	Cows per per 100 acres.	Cost of fertilizer per 100 lb. of fat.
	s. d.		*s. d.*
Under 75	5 8	29	9 11
125 to 150	10 9	52	7 10
200 to 225	14 8	71	7 0
Over 250	18 10	87	6 8

These figures were obtained by the New Zealand Department of Agriculture from a survey of over 500 farms in the North Island and, therefore, may be taken as typical.

Queensland herd testing figures for the last six years are:—

Year.	Number of cows tested.	Fat per cow. lb.
1932-2	10,383 ..	165
1932-3	12,690 ..	166
1933-4	29,521 ..	161
1934-5	24,334 ..	154
1935-6 (drought)	14,422 ..	141
1936-7 (drought)	6,530 ..	134

From information supplied by the Government Statistician the figures for the whole of the State are—

Year.	No. of Dairy cows.	Fat per cow. Lb.	Percentage of cows submitted to herd testing.
1931	775,301	127	1·3
1932	792,943	127	1·6
1933	877,709	127	3·4
1934	939,254	137	2·6
1935 (drought) ..	955,746	119	1·5

Some allowance should be made in respect of the average fat per cow taken from the Statistician's figures, as these include the production of herds which are milked only during the flush of the season and which should not be regarded as dairy herds.

Not only is the average production per cow very low, but the percentage of cows submitted to herd testing is most unsatisfactory. The average production is likely to remain low until dairy farmers take full advantage of herd testing facilities open to them, and apply more widely the principles of both herd improvement and pasture management.

Plate 279.
Golf Hill Chevalier, Champion Hereford bull at the last Brisbane Show; exhibited by E. R. Reynolds.

Plate 280.
Cootharaba Fancy IV., Champion Hereford cow at the last Brisbane Show; the property of J. J. Galloway.

Plate 281.
Bald Blair Watt, the Aberdeen Angus bull that won the Champion Award in the last Brisbane Show; owned by F. J. White and Sons.

Plate 282.
Bald Blair Nora II., Champion Aberdeen Angus cow at the last Brisbane Show; the property of F. J. White and Sons.

Pneumonia in Swine.

JOHN LEGG, D.V.Sc., Government Veterinary Surgeon.

PNEUMONIA in young pigs is a very common disease in the dairying districts throughout the State. It appears to take on characters of contagious nature, and may spread very rapidly throughout a piggery. Once it is well established it may cause considerable losses, not only because a certain number of pigs are fatally affected, but because many of the recovered animals are left in such a state that they do not fatten and fail to reach maturity. Such pigs are commonly known as "runts" and are a distinct source of monetary loss to the farmer.

In America and Europe much work has been done in determining the exact cause of the various types of respiratory diseases in live stock. However, although the exciting causes have been discovered, it has been found that secondary factors have an influence on the development of these diseases. Little work of a similar nature has been carried out in Australia, but there seems to be little doubt that in this country, as well as in Europe and America, secondary factors are very important. These secondary factors can be summed up in unhygienic and dirty surroundings, herding of large numbers of pigs in relatively small areas, feeding numbers of pigs of various sizes and condition in common troughs, lack of sufficient exercise grounds and want of sufficient green stuff.

Generally speaking, the younger animals are much more seriously affected than the older and if the young pig contracts pneumonia in the course of the first few weeks of its life, the economic value of a litter may be reduced to negligible proportions.

It becomes necessary, therefore, to adopt all those precautions which mitigate against the spread of this disease, particularly among young stock. Isolation of the sow before farrowing and the maintainance of the litter under proper conditions during the first few weeks of life are very important. A reasonable degree of cleanliness is demanded; the

avoidance of wet cold sties, proper exercise for the mother and a properly balanced ration all help to develop a vigorous and healthy constitution in the young pig. Isolation of the young animal cannot be carried on indefinitely, but, given a good start, the young animal is usually strong enough at weaning time to resist any possible infection which it may contract when the weaned pigs are brought together for fattening purposes on the farm.

Contagious pneumonia is not, as a rule, difficult to diagnose. The young pigs are unthrifty, do not eat well and show a tendency to isolate themselves from the others. There is usually a discharge from the eyes and nose, but one of the most prominent symptoms is coughing.

FEEDING BACON PIGS.

E. J. SHELTON, Senior Instructor in Pig Raising.

Because of the conditions associated with the recent prolonged dry weather in Southern Queensland—from the effects of which the pig industry is still suffering—and of the fact that the price charged for pig foods of all descriptions is still very high, many pigs arriving at bacon factories are not in the primest of condition. When slaughtered their carcasses dress out soft, slightly discoloured, and, on grading, are classed as of other than the choicest grade; in fact, some are very fat and too heavy.

In some instances the fat is soft and oily, and in others it is of a slightly yellowish colour and will not "firm up" during the chilling process. If used for small goods, this soft, oily, discoloured meat still carries objectionable features. The loss to the industry through this trouble, plus the lower condition of many of the pigs that kill out to advantage, must be very heavy, for it is impossible to expect factories to pay top prices for second or third grade carcasses.

The Department of Agriculture and Stock, therefore, offers the following advice to farmers, especially in districts south of Rockhampton:—

Soft, Oily Pork.—Although several foods may be responsible for this soft condition, all the evidence points to the fact that the chief cause of the trouble is the feeding of peanuts or meal manufactured from peanuts to pigs which are being finished or topped up for the market. Maize and other grain foods are relatively scarce and high priced, and as peanuts produce particularly fast growth in pigs, farmers are naturally tempted to use them or the meal in place of grain. The position could be relieved if pig raisers would concentrate their peanut feeding on the breeding stock and young store pigs, which will make very good use of surplus peanuts, and then other foods available could be kept for the pigs from the store stage until they reach bacon weights. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

Yellowish-coloured Pork.—It is known that the probable cause of this condition is an excess of carotin, a colouring matter in plant life, and which is present especially during the early life of the plant and at the stage when (as in the case of pumpkins) the crop is fully ripe or

over-ripe. The feeding of an excess of green wheat, oats, or barley, in the absence of, or short supply of milk may also be responsible; so also may the continuous use of grass or of lucerne as the principal food.

Low-conditioned Pigs.—Lack of condition is, of course, invariably due to lack of sufficient nutritious food. When pigs are in such a condition they become more liable to infestation by internal and external parasites, which irritate the animal and cause much restlessness, especially at night.

It is better to keep fewer animals and to feed them properly than to attempt the keeping of more than the number for which food is available. It is better, too, to market the pigs when light and prime than to carry them on to heavier weights with loss of condition. Where milk is in short supply, meat meal may be used as as substitute. In all cases, the pigs should have clean drinking water and mineral material like charcoal.

Bruised and Damaged Pigs.—Where pigs are weakened as a result of lack of condition and where they are soft in texture—the result of improper food—they bruise much more readily, and tend to be more discontented. The only way to avoid bruising is to have the animals in the primest condition (not over-fat) and to treat them kindly and not force or beat them when when loading or unloading. Avoid kicking them or forcing them through narrow gateways or over rough stony yards.

Over-fat Pigs.—Despite high-priced foods, there is still a proportion of over-fat and very heavy weight stock coming forward. Pigs should not be fed too heavily on grain, but should be kept growing and given abundant exercise in grassy pastures. It is a mistake to keep pigs penned up continuously in small sties and bare yards. The use of flesh-forming foods like milk, meat meal, lucerne, greenstuffs, &c., and mineral matters will tend to overcome any tendency to over-fatness.

HINTS ON PIG-FEEDING.

Grain feeding enters largely into successful pig raising, so that the form in which it is fed is important. Pigs which have been fully fed with corn through their growing period usually make good use of the whole grain, and corn-in-cob feeding may be adopted. Animals that are fed with corn only occasionally may not masticate it thoroughly, and a waste is incurred. For these a preliminary cracking is advisable.

Well-ground grain is fed usually only to stud animals or stock for exhibition.

The appearance of whole grain in the dung may encourage pigs to eat excreta. This is a clear-cut case for grinding.

Milling by-products are usually fine, and this may be a disadvantage when the pens are in an exposed position or during windy weather. The waste may be reduced considerably by wetting.

There is no need to prepare pumpkins or squashes, beyond the breaking of hard-skinned varieties, e.g., ironbark pumpkins.

Most tubers may be fed as harvested, or the pigs can be allowed to harvest for themselves. It is advisable to cook potato "culls."

Milk, milk products, seed cake preparations, meat and blood meals, and cereal by-products require no preliminary treatment whatever.

Lucerne or other roughages are well masticated usually by older pigs, and young pigs eat such small quantities that there is no point in chaffing.

LOSSES AMONG YOUNG PIGS.

Of all the losses with which the pig raiser has to contend, none involves such heavy financial loss as that associated with mortality in young pigs prior to the stage, and age, at which they are ready for marketing. Probably 25 per cent. of the average litter of pigs is lost before the weaning age (eight weeks), and from 20 to 25 per cent. of the remaining pigs fail to reach the market at an age at which they would return the maximum profit.

Careful investigations made in New Zealand showed that the commonest cause of loss before weaning is lack of attention at the time of farrowing, a number of pigs being suffocated at birth or killed by the sow. It was found that premature birth had caused considerable losses, while the number of still-born pigs either perfectly or incompletely developed was also considerable.

Most of these losses were considered to be due indirectly to defective feeding of the brood sow and to mineral deficiencies in the diet.

It must be remembered that pregnant sows may be underfed and improperly prepared for farrowing in several ways. Lack of succulent green food, drinking water, mineral matter, readily digestible food, and also want of exercise, are frequent causes of trouble at farrowing time. New Zealand experience was that, far from causing harm, a liberal feeding of the brood sow resulted in the production of heavier and better pigs at birth, provided, of course, the sow was active and healthy.

The remedy on many farms lies in providing necessary supplements to the food supply—such as meat meal, root crops, and plenty of milk, with the addition of mineral matter.

Strict limitation of the food supply a day or two before farrowing is necessary. Careful feeding, a clean, dry, nicely bedded pen with suitable farrowing guards, and quiet surroundings in which the sow can settle down to farrowing are very important.

Losses after weaning also are unusually heavy where improper management exists. In New Zealand it was estimated that approximately 125,000 pigs, which should be available for slaughter as porkers or baconers, die every year before reaching that stage. The period dating from the eighth to the twelfth week after birth is one of the most susceptible in the life of a pig. The system adopted should aim at feeding the young pig in such a way that there will be no check in growth prior to, at the time of, or after weaning. Care should always be exercised to minimise the shock of the change over from the sow's milk to other foods by providing, for instance, a separate pen in which the young pigs can feed apart from the sow.

The greatest check in growth results from the young pigs having to contend with older pigs at the feeding trough. Additional hindrances are overcrowding, filth, dampness, parasite infestation, and lack of clean drinking water.

—E. J. Shelton, Senior Instructor in Pig Raising.

A PROFITABLE SOW.

Mr. Dave Johnston, of Malanda, North Queensland, in reporting the loss of his well-known large white sow "Hillcrest Rosebud," winner of many champion prizes at Tableland and Cairns shows, advises that this sow was mated on each occasion to the large white boar "Commonwealth Candidate." Her records are as follows:—

HILLCREST ROSEBUD. Registered No. 2787.

Date of Birth of Litter.	No. of Pigs in Litter.
19th December, 1932	17
18th July, 1933	18
27th January, 1934	20
12th August, 1934	19
9th January, 1935	18
27th September, 1935	17
23rd February, 1936	12
1st October, 1936	19
4th April, 1937	15
4th October, 1937	18

To have produced that number in ten litters is a meritorious performance and again demonstrates the productiveness of the modern brood sow.

Ophthalmia of Domestic Animals.

ROSS NOTT, B.V.Sc., Government Veterinary Surgeon.

THE disease known as ophthalmia, which is an inflammation of the eye, and often is referred to as "blight" or "pink eye," affects all the domestic animals, although it probably is encountered most frequently in cattle and sheep.

The disease is contagious and is brought about by the entrance of a special germ into the eyes. Injury to the eyes such as is caused by grass seed is considered sometimes to be the sole cause of blight. This, however, is incorrect, for the true contagious form of the disease cannot be produced unless the specific germ is present. It must not be overlooked, however, that any foreign material which becomes lodged in the eyes will set up irritation and give rise to a non-contagious form of ophthalmia, and, secondly, eyes in such a condition are more susceptible to the contagious form.

The infective material which is responsible for setting up new cases is present in the discharges from the affected eyes, and frequently it is carried from one animal to another by flies. Another method of spread, particularly with sheep, is by long grass, &c., becoming contaminated with eye discharges, which are transferred later to the eyes of healthy animals grazing over the same area.

The first change noticed following infection is a watery discharge issuing from the inner corners of affected eyes. If the eyes are examined at this stage, evidence of inflammation will be seen in the form of a general reddening and enlargement of the minute blood vessels. As the disease progresses the discharge becomes more copious and full of pus, and the eye generally becomes dull. If no treatment is given, a film appears over the eye and the animal becomes temporarily or in some cases permanently blind. The film is due to an inflammation of the surface layer of cells. Frequently the case does not extend beyond this stage, and even without treatment the eyes begin to recover gradually and rturn to normal. In other cases the inflammation may extend to the deeper structures, leading to permanent blindness in one or both eyes. In those cases which recover without treatment the animals may be blind partially or totally for up to a week, and during this period they are difficult to drive and usually lose condition. Losses are also experienced through the animals becoming separated from the rest of the herd and not being able to find water.

If animals are treated in an early stage of the disease they recover quickly. Several mixtures may be used in the form of drops into the eyes, and very good results have been obtained with a 2 per cent. solution of zinc sulphate. To make this solution ½ oz. of zinc sulphate is dissolved in 1 pint of clean water, which has been boiled and allowed to cool. A 5-10 per cent. solution of argyrol also is effective. For treatment, about ten drops of one of the mixtures mentioned are dropped into each affected eye at least once, and, when possible, twice or more daily. The treatment should be continued until the eyes have returned to normal.

In the case of valuable animals the discharge should be cleaned away from the eyes with a boracic acid solution, and yellow oxide of mercury ointment (1-50) should be applied to the lids to prevent them from sticking.

As the disease is contagious and rapidly spreads from animal to animal, the affected cases, particularly when only few in number, should be isolated until they have recovered completely. Particular care should be taken when new animals are introduced to see that they are not infected, as the disease often is introduced into and spread through a flock by such means.

In the case of sheep it is wise, when facilities are available, to treat all the animals and to draft off those showing evidence of the disease for more intensive treatment in a small hospital paddock.

WOUNDS IN HORSES—SIMPLE TREATMENT.

The fundamental principle underlying all wound treatment is the provision of suitable downward drainage for the discharge from the wound. If such drainage is provided then most wounds tend to heal well, but deep wounds penetrating downwards and which form pockets do not progress satisfactorily, for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little treatment beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds it is necessary to use a knife judiciously in order to allow the discharge a free outflow.

Before any wound treatment is attempted, the injured edges of the wound should be clipped with scissors to remove the hair and reveal the true nature of the wound. The next thing to do is to wash the wound thoroughly with a warm, weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt probe which has been boiled, or with the fingers after the hands have been thoroughly washed and scrubbed. Punctured wounds—such as nail or stake wounds—are always difficult to drain and often have to be opened up. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature may gather in the foot, and may continue to accumulate because it cannot drain away. If that happens, acute lameness is certain to follow. If unattended, these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by that time the structures within the foot are in a nasty mess and the case has become very serious.

To treat hoof punctures, the whole foot is cleaned and, if possible, it is held in a bucket of warm disinfectant solution to still further cleanse it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole at the point where pain is most acute. The apex of the cone must be carried right through the horn until blood or pus is revealed. The pus should then be allowed to drain away. To prevent the hole from closing, a pad soaked in a solution of iron perchloride should be placed in the wound and the treatment should be repeated daily while necessary. If treated thoroughly in the way described little further attention is necessary.

CARELESS BRANDING.

Slovenly methods in the branding of stock, particularly cattle, are in evidence far too frequently, the results being most undesirable in many respects. Quite often the carelessness with which the branding irons are applied involves cruelty, although it may be unintentional.

It is cruel to hold the hot iron on an animal until the skin is burnt through, and it cannot be justified on the score of necessity. This practice may be due to underheated irons, but, on the other hand, it may be due to over-hot irons held on the skin a fraction of a second too long, or with too much pressure. Such branding causes blotches, and very often the actual letters or figures are undecipherable. The skin in the area involved is ruined for tanning purposes, and festering sores may result. Identification of the animal by means of such a brand is rendered very difficult, if not impossible.

It is a well known fact that, on large stations, where thousands of calves are branded yearly, and where speed is a factor in the handling of large mobs, the standard of branding is much higher than on some small holdings—such as farms, where only two or three calves may be branded at irregular periods.

Castration of Colts.

W. DIXON, Inspector of Stock.

THE best time of the year to perform this important operation is the spring, when rain has fallen and green feed is available, and before the hot weather has set in.

The colts to be gelded having been yarded over night, it is desirable, before proceeding with the operation, to take precautions against losses through infection of wounds. Crude carbolic acid or phenol in a solution of 7 oz. to 1 gallon is a suitable disinfectant, and should be sprayed over the ground and rails of the yard.

All instruments used should be sterilized by boiling for at least ten minutes, and should be wrapped in a sterile towel and kept in a box at the yard until required.

After each colt is done the instruments and hands of the operator should be washed in a weak solution of carbolic acid, this solution being kept in a separate vessel, and only sufficient for each disinfection being poured into a dish for the purpose, and then thrown away. The practice of using a petrol or kerosene tin filled with disinfectant to wash instruments and hands time after time is risky.

For unbroken colts, the rough and ready methods of roping, choking, and throwing as practised on many stations may cause the loss of valuable animals. These losses may be minimised if a crush with side gates is available, so that the colt can be haltered and side lines used on him before the gate is opened to cast him.

The colt, having been cast on his left side, the hind legs drawn up to the shoulders and made fast with half hitches, the fore legs can now be secured with the knees bent to the hind feet.

The scrotum, sheath, and penis should be washed with warm water and soap, care being taken to remove any suety deposit from the penis and the cavity at the end of the penis. The left or lower testicle (the colt being on his left side) is seized in the left hand, and pressed until the skin is tight over it; a bold incision from front to back, parallel with the median line is now made, penetrating the outer skin and the tunica, laying the testicle bare. As the incision is made, the cord should be grasped firmly in the left hand to prevent the retraction of the testicle upwards through the canal. When this happens it is sometimes difficult to recover, and the subsequent manipulation in an attempt to bring it down delays the operation, and causes unnecessary shock to the patient. The knife is now slipped between the anterior and posterior portions of the cord, and the latter (posterior), which the muscle retracts, is cut completely through.

The testicle now lies inert, connected by the anterior portion of the cord, whih is composed of blood vessels, and should be drawn out until it is taut, without using force, when the emasculator (if that method is being used) should be used close to the belly, with a slow squeezing movement, taking care that the crushing part is nearest to the belly, and the cutting part to the testicle. The cord should be severed as short as possible, so that it may not hang below the wound, and so cause complications.

The other testicle may now be removed in a similar way.

It is advisable to swab the wound with a solution—1 to 2,000—of chloride of mercury. The ropes may now be removed, and the colt allowed to rise and walk out of the yard, so as to be away from dust.

If the operation has been performed carefully, and all antiseptic precautions taken, recovery should be rapid and no further treatment is necessary, but if undue swelling is noted, the wound should be opened with the fingers, after washing the hands with carbolic solution, so that there may be free drainage, and the wound swabbed with disinfectant.

Some bleeding always occurs, but rarely lasts for more than half an hour, but if copious bleeding persists after that time—as is the case when emasculators have been used carelessly—the cord must be found, and the artery tied with silk thread. If the stump of the cord cannot be found, the canal should be plugged with pledgets of tow or wool soaked in muriate of iron of the same strength as obtained from the chemist, which helps to form clots, and so closes the artery.

LAND FOR GRAZING HOMESTEAD SELECTION.

A resumption from Evesham holding has been surveyed as portions 5, parish of Montford, and 3, parish of Worcester, and will be open for grazing homestead selection at the Land Office, Longreach, on Tuesday, 18th January, 1938.

The portions are situated 3 miles westerly and 20 miles south-westerly, respectively, from Morella railway station on the Longreach-Winton railway.

The areas of the portions are 19,557 acres and 29,380 acres.

Each selection will be for a term of twenty-eight years and the annual rent for the first period of seven years is 2¾d. per acre.

Each selection must be stocked to its reasonable carrying capacity with the applicant's own sheep during the first three years.

The portions are watered by sub-artesian bores and tanks. They comprise open pebbly and brown soil downs, lightly to moderately shaded, well grassed with Mitchell and Flinders grasses, and are good wool-growing and fattening country.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Longreach, and the Queensland Government Tourist Bureaux, at Sydney and Melbourne.

NEATSFOOT OIL KEEPS HARNESS IN GOOD ORDER.

For keeping harness in good order, neatsfool oil needs no recommendation to farmers.

Neatsfoot oil is made by boiling in a suitable receptacle the feet and leg bones (up to the knees) of well-grown cattle. The material should first be thoroughly cleaned by scalding and scraping it free from hair, dirt, &c.; it should then be covered with water, which should be brought to the boil and then allowed to simmer for about two hours. After the oil has risen to the surface it should be skimmed off and the mixture boiled again, and a second skimming made.

The oil thus secured should be strained through a piece of cheese cloth, in order to remove pieces of flesh, &c., from the mixture, and the strained product should then be boiled again, great care being taken that it does not catch fire. Finally, it should be strained again, cooled, and bottled. Pure neatsfoot oil should be light lemon in colour.

The method described is for manufacture on a small scale. Manufacture for trade purposes necessitates the use of a much more detailed and tedious process.

Breeding Fowls for Egg Production.

J. J. McLACHLAN, Poultry Inspector.

IN breeding poultry the farmer should exercise the utmost care in order to establish and maintain a high-quality flock. The progress made in the past has been considerable. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with egg-production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote 12 dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than 13 dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. There were 116 pullets used in this experiment and it will be noticed that the average of the two years was over 15 dozen eggs, and even these birds in their second year laid over 13 dozen. These birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding in conjunction with good management and feeding.

The chief considerations in arriving at the standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds that are reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and consequently would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded irrespective of other characteristics.

Points for Poultry Breeders.

J. J. McLACHLAN, Poultry Inspector.

THE poultry farmer, in selecting birds for breeding purposes, should reject any bird which does not measure up satisfactorily in constitutional vigour, irrespective of other considerations.

A strong bird has adequate size, is well-fleshed, with prominent eye, full face, a sprightly carriage, and is very alert and active.

Although there actually is no egg-laying type of bird, there are some very definite laying characteristics which are valuable in the selection of birds for either breeding or production. For instance, capacity is essential to permit of the necessary expansion in the reproductive organs of a hen. The ovary develops from about the size of a two-shilling piece to approximately the full circumference of a teacup, and the oviduct from about 9 inches long and ½ inch wide to about 18 inches long and 1¼ inches in width. In addition to this it may be mentioned that a laying fowl consumes more food than a non-layer: thus the intestines would contain more food. A bird should have a long, deep, wide body, or, in other words, capacity.

The head is another valuable guide, particularly in respect to health. The face should be full, red in colour, and fairly free from feathers. Sallow or sunken-faced birds should be avoided. The eye should be full, round, bright, prominent, and expressive.

Strict attention should be paid to the colour of the eyes, particularly with breeds that should have red eyes, as there is a tendency for such breeds to have greenish-coloured eyes. Birds with green or light-coloured eyes are prone to become short-sighted and even go blind early in life. The skull should be strong but fine, and birds with overhanging eyebrows should be avoided.

The plumage of the birds, as it walks around the pen, should be examined, and careful notice taken as to whether the plumage fits close to the body or is loose and fluffy. As the tight or close-feathered bird usually is a better layer than the loose-feathered bird, it is only natural that only the former should be bred from. To the inexperienced person the contrast in feathering is more easily noticed in heavy breeds such as Australorps than in White Leghorns.

The thickness of the shanks is a good guide with respect to the coarseness or fineness of the bone. A coarse-shanked bird is a coarse-boned bird, and generally a poor layer. A layer-breeder has fine shanks, and the undersized bird, as a general rule, has over-refined or spindly shanks.

Any bird which is a known layer of small eggs should be passed over. As far as is possible only birds which lay eggs slightly above 2 oz. in weight should find their way into a breeding-pen.

Special care must be given to the selection of the male bird. All the features mentioned regarding type of females apply also to males. An active, alert bird should be selected, as such males will give better fertility and stronger chickens than will dull, slow birds. Young males can be mated with more females than older birds. Twenty females

can be mated with a White Leghorn cockerel and sixteen females with an Australorp cockerel, if in each instance a vigorous male is used.

Male birds, the sons of known producers of large eggs, are most valuable, as the characteristic of production is transmitted from the hen, through her son, to her granddaughters.

Should pullets be used as breeders? is a question that is frequently asked. The answer to that is that if they are fully matured and up to standard in respect to type and size, and produce eggs of the recognised weight of 2 oz., they should be equal to older birds as breeders. Why object to breeding from pullets and at the same time use cockerels for mating purposes? It must be admitted, however, that where records are kept of egg production, breeding from hens which are heavy layers has proved more profitable than breeding from pullets, which more or less are an unknown quantity.

Plate 283.

[*Photo. P.E.I. Branch.*

On the Road to Kirrama State Forest, North Queensland.—This new road gives access to hitherto untapped timber lands in which Kauri pine and other cabinet woods abound. It is one of the several large forestry road projects in progress in the Far North, the work of the Public Estate Improvement Branch of the Lands Department.

Summer Cultivation.

DURING early summer the soil should be kept free of weeds and the surface loose. For this purpose it is a very common practice to make frequent use of cultivators.

The cultivator certainly covers the area rapidly and is useful in quickly checking evaporation by breaking up a crust formed after rain, but there are objections to its too frequent use. The surface soil becomes too fine, which prevents subsequent rain from freely percolating through it, and thus much of the moisture flows away or is evaporated instead of soaking in, and if much flowing occurs surface soil is also carried away. The fine soil also becomes easily caked even by small falls of rain, and the mulch is, therefore, easily destroyed, and in showery weather requires very frequent renewal. Constant use of the cultivator also forms a sole pan; thus as the season progresses the mulch becomes more shallow and, consequently, less lasting, while the sole pan also prevents free percolation of rain or artificially applied water, which means further loss by evaporation or actual flowing away.

The plough, on the other hand, leaves the surface in a condition which allows the rain to percolate more freely and forms a more lasting mulch, as it is not so easily destroyed by light rains; the plough, moreover, is more efficacious for keeping down weed growth. Weeds are not harmful until their roots have extended through the mulch and are drawing on the moisture below, but if one is depending on the cultivator to keep them down they must be dealt with while they are far smaller than if one uses a plough.

Summarised, the arguments for greater use of the plough for summer cultivation are that a more enduring mulch is obtained, weeds do not require such frequent attention, water is enabled to percolate more readily, and loss of surface soil is reduced. It is only fair to state that heavy rains, which will destroy the mulch, may occur soon after the use of the plough, and in such cases the advantage of the more lasting mulch is lost; however, this does not always occur, and the other disadvantages remain. The cultivator should be looked upon as a quick

substitute, and should be used chiefly when it is desired to check immediate evaporation, and the work should be more thoroughly carried out with the plough later as time permits.

One objection to the use of the plough for summer cultivation is that it upsets the levels of the land. This is of greater importance where irrigation is practised. The drawback can be minimised, if not wholly overcome, by using a plough with the mouldboards removed.

Plate 284.
A Wheat Crop at Columboola.

It is sometimes argued that it is risky to use a plough among deciduous fruit trees during their active period on account of injury to the roots. Undoubtedly, by the careless use of the plough damage can be done, but though it may not be so discernible, careless use of the cultivator can also cause root injury. Moreover, because the plough maintains a deeper mulch throughout the season, as already mentioned, the trees are prevented from forming roots too close to the surface. The greatest risk of serious root injury occurs when the later winter ploughing is delayed until the trees are active in the spring—feeding roots are disturbed just when there is heavy demand on the trees by blossoming and fruit setting.

FERTILIZER FOR STANDOVER CANE.

It is well recognised that a two-year-old crop of cane possesses the virtues of an early-maturer, in that it possesses a high sugar content early in the harvesting season. Indeed, it is often found that such a crop tends to over-maturity as early in the harvesting season as August, and any grower who has much of this class of cane to harvest is advised to take steps to offset the disadvantage of having too much mature cane early in the season.

A very simple means is at the disposal of the grower, and the following method is recommended to all farmers with stand-over cane. It has been proved that sulphate of ammonia both improves cane yields and delays maturity. Therefore, an application of even one bag of sulphate of ammonia per acre, applied in the spring, to one-year-old cane, will assure a vigorous second-year growth and delay the maturity of the crop sufficiently to enable it to be harvested when just mature. Cane at the peak of maturity always gives the best returns to the farmer.

—H.W.K.

Save P.O.J. 2878!

THIS appeal is directed to cane farmers in Southern Queensland, particularly in the Moreton area, where the variety P.O.J. 2878 is giving such remarkably good results, especially as a standover cane. P.O.J. 2878 was introduced into Queensland in 1928 during the search for suitable gumming disease resistant varieties. Experimental tests soon established the fact that it possessed very high resistance to gumming and mosaic diseases, the then chief diseases of the South. Farm trials followed and these demonstrated the great value of this cane as a farm

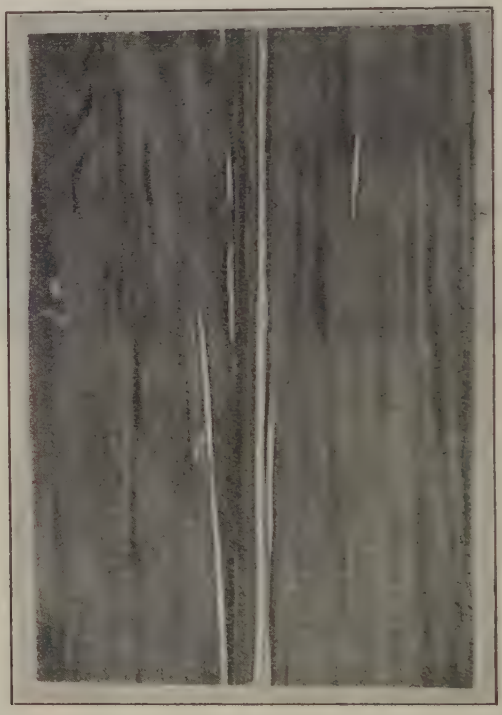


Plate 285.

Illustrating the small gall-like swellings of the veins which occur on the under surface of leaves of plants affected with Fiji disease. One long gall may be seen in the centre, running the whole length of the photograph; the smaller galls scattered over the leaf are of the size most usually seen. This leaf is reproduced at natural size.

cropper. Its vigorous growth, resistance to drought and wet conditions, strong ratooning, and the gumming resistance which enabled it to be stood over to make rapid second year growth, all combined to recommend it to the farmer. From the farmer's point of view the variety has, in fact, only one really serious drawback in Southern Queensland and that is its susceptibility to Fiji disease. P.O.J. 2878 contains $\frac{1}{8}$ "wild blood"; it is this wild blood which confers the resistance to gumming and mosaic diseases but, unfortunately, at the same time confers susceptibility to Fiji disease.

Plate 286.

An advanced stage of Fiji disease attack on a growing stalk of cane. The leaves have become stiff, stunted, and misshapen, and the top looks as though it had been chewed by some animal; such leaves bear on their under surfaces galls of the type pictured on page 714. At this stage all further growth has ceased and the stalk dies before long.

Fiji disease is common in parts of the Maryborough area and P.O.J. 2878 is a disapproved variety there in consequence. The disease is not very prominent as yet in the Bundaberg-Isis, Bauple and Moreton districts, but it has spread in the past few years and constitutes a continuous menace to the successful cropping of P.O.J. 2878, especially on irrigated and river flat lands. It is true that up to the present the damage in the Bundaberg-Isis, Bauple, and Moreton areas has been almost negligible; obviously, *now* is the time to take precautions. Even if unchecked spread were allowed to take place the total damage in two-three years' time might still be comparatively light *but by then it will have become difficult to obtain reliable disease free plants and trouble will be right on the doorstep.* Once that stage is reached the days of P.O.J. 2878 will be numbered.

Plate 287.

The two small grass-like stools in the foreground are the result of ratooning diseased stools. The planting of infected cuttings yields a similar type of plant. Variety P.O.J. 2714, all stools nine months old.

Fortunately, if the required small amount of care is exercised now, while the amount of disease is small, the menace may be held in check. A reading of the following notes should enable any farmer to recognise the disease when he sees it and to take the necessary simple measures for its control.

Symptoms of the Disease.

Fiji disease appears to have originated in New Guinea but first came into prominence in Fiji, where it caused havoc about the beginning of this century. The earliest symptom, and the peculiar characteristic of the disease, is the production of small yellowish galls on the under surface of leaves of diseased cane (see Plate 285). These galls may vary from one to many per leaf; they are formed by the enlargement of the veins of the leaf and might be pictured as a sort of varicose vein; they are usually 1-32 to 1-16 inch in diameter and range from $\frac{1}{8}$ to 2 inches in length. In the later stages of the disease the leaves become

Plate 288.

Clustered stool is often seen in some of the P.O.J. canes and resembles the grass-like shoots of one stage of Fiji disease (see Plate 287). It can readily be distinguished from Fiji disease by the fact that no small galls are borne on the under surface of the leaves.

shortened and erect, very stiff and brittle, and take on a darker green colour. In this stage the cane top often looks as though it had been eaten by some animal (see Plate 286); no further growth now occurs, the leaves become smaller and smaller and eventually the heart dies.

When diseased setts are planted, or when diseased stools are ratooned, the resultant plants are always diseased and in most cases produce no cane but remain a cluster of grass-like shoots (see Plate 287). An examination of the under surface of these small leaves will show the presence of the small leaf galls described above (refer to Plate 285 again).

The freak known as "clustered stool" (see Plate 288) may be confused with Fiji disease at times. Occasionally some varieties, and particularly some of the high numbered P.O.J. canes, fail to produce a normal stool but give rise to a cluster of grass-like shoots (compare with Plate 287). This condition is due to "sporting" and it may easily be distinguished from Fiji disease by the absence of any small galls on the under surface of the leaves (see Plate 285).

Spread of the Disease.

Experiments carried out some years ago by Messrs. Bell and Mungomery proved that Fiji disease is spread from plant to plant by a small brownish insect, about $\frac{1}{8}$ inch in length, known as the sugar cane leaf-hopper. The insect absorbs infected juice when feeding on diseased cane and then injects it into the next healthy cane on which it feeds.

After the leaf-hopper has infected a new plant there is a lapse of time—sometimes months—before the symptoms appear. Consequently it is impossible to be certain of selecting all healthy plants from the healthy-looking plants in the vicinity of diseased cane.

The leaf-hoppers become much reduced in numbers during winter and spring and usually do not increase greatly in numbers until about December, reaching their greatest numbers about February. It naturally follows, therefore, that spread of the disease is most rapid in the wet season months and least during winter and spring.

Control of the Disease.

In those districts where this disease occurs the following rules should be carefully carried out:—

1. Plant only disease free cane, taken from disease free farms, when susceptible varieties are planted.

2. Inspect all young plant and ratoon cane at regular intervals and dig out any suspicious looking stools. Since the leaf-hopper becomes very scarce during winter, and remains so until about December, the inspection of fields and digging out of diseased stools should be completed by November-December.

3. Do not continue to ratoon diseased crops.

4. The better the conditions for cane growth the better are conditions for the spread of Fiji disease. Therefore, special care is necessary on rich alluvial land or irrigated farms.

5. Where the disease has become established, resistant varieties should be planted in neighbouring fields. P.O.J. 213, P.O.J. 234, Co. 290, Q. 813, Korpi and Oramboo are resistant; H.Q. 285 (Milton) and Mahona are also resistant but are susceptible to gumming disease. P.O.J. 2714, P.O.J. 2725, P.O.J. 2878, 1900 Seedling and D. 1135 are susceptible.

6. Keep a watch on neighbouring fields; Fiji disease is just as dangerous when on the next farm as when on your own farm.

7. Procrastination and indifference are the friends of Fiji disease—never leave until to-morrow any inspection or digging out of diseased stools which can be done to-day.

—A.F.B.

Drainage for Wireworms.

THE following notes are issued in respect of the low-land wireworm pest, particularly in the Mackay area. Other species of wireworms may be found in well drained and elevated lands but the damage to cane caused by them is of little consequence, although they are often blamed for bad strikes due to other causes.

As was forecast in the Quarterly Bulletin for July, 1936, damage to cane plantings by wireworms in the Mackay district was both widespread and severe during the spring of 1936. In very many cases the warning issued against early planting went unheeded, with the result that many blocks had to be heavily supplied or replanted. At the

Plate 289.

A poor stand of cane in a badly drained depression due to the eyes of setts having been destroyed by wireworms.

Mackay Experiment Station Field Day and again in the Quarterly Bulletin for July of this year it was pointed out that the wet season had been such as to favour the development of wireworms and a warning was again issued against early plantings where drainage was inadequate.

In addition, on each occasion, the necessity for drainage *prior to the wet season* was emphasised. As we have repeatedly pointed out, in its young stages the young wireworm requires extremely wet soil conditions in order to survive, although it can later withstand very dry conditions. It is to avoid providing this extremely wet condition during the rainy season that adequate drainage is necessary.

Severe losses have been caused by wireworms during the current spring and are still being experienced. As is usual at such times many theories and "cures" are advanced, but exhaustive experimenting and practical experience in the Mackay district has proved that the only method of controlling the lowland wireworm pest of cane is to have the land thoroughly drained in readiness for the wet season prior to planting.

Consequently, all farmers who have fields which are to be planted in 1938, and which are liable to wireworm attack, should immediately set to work and provide the necessary drainage. It is realised, of course, that some fields, or parts of fields, cannot be drained satisfactorily and in such cases, following a heavy wet season, planting should be delayed until late September at the earliest.

Advice as to drainage systems or information regarding farms where the wireworm damage has been eliminated by proper drainage, will be given on application to the Entomologist, Sugar Experiment Station, Mackay. Good drainage is not only valuable from the point of view of wireworm control—it is good sound agricultural practice whether wireworms are present or not.

W.A.McD., in the "Cane Growers' Quarterly Bulletin."

SUGAR-CANE VARIETIES FOR SOUTHERN QUEENSLAND.

Those growers who have not yet experienced the benefits from growing the new gum-resistant canes, which recently have become so popular in Southern Queensland, are urged to include some in their present planting. The results from all trials harvested to date indicate that Co. 290 will produce a much heavier yield than any other variety on practically all types of soil. It generally gives a fair c.c.s. value, while at times very good returns are reported. On damp alluvial lands it tends to maintain continuous growth, and with an "open" winter, heavy cane tonnages with low c.s.s. might result. Such conditions constitute but a small proportion of the lands on which the variety could be planted.

For all-round performance, P.O.J. 2878 is to be recommended strongly. For vigour of growth and drought resistance, it definitely excels, and as a standard cane it has no equal. This is a most important feature, as it enables the Southern grower, on frost-free areas, to revert to the "two-year cropping" methods, which were so popular before gumming disease took its toll, and which enable the grower to effect such a substantial lowering of the costs of production. In these times, when excessively large crops demand that a proportion of the cane be stood over, no cane responds so satisfactorily in its second year of growth as a ratoon crop of this variety.

P.O.J. 2725 is a cane which has shown remarkable yields where moisture conditions are suitable, and it definitely is a valuable cane for irrigated land. Near the coast, it exhibits an unfortunate tendency to arrow early, which is a detriment if the farmer is obliged to stand-over the crop.

—A.F.B.

FERTILIZING SUGAR CANE.

As the outcome of experiments by the Bureau of Sugar Experiment Stations it has been established definitely that it pays to fertilize sugar-cane crops on all old lands. It is found, also, that there is no one "best kind" of fertilizer for all types of cane soil, but that special mixtures are necessary for particular conditions. The Bureau has devised three special mixtures which are now prepared by all leading manufacturers, and farmers are urged to use these "Sugar Bureau" fertilizers at all times. No. 1 mixture is rich in phosphate, low in potash, and is generally suitable for alluvial and forest lands. No. 2 mixture is suitable for red schist soils and lands requiring a balanced mixture, while No. 3, rich in potash, should be employed exclusively on red volcanic soils.

It should be noted that these mixtures contain very little of the plantfood nitrogen. Their use, therefore, should be combined with top-dressings of sulphate of ammonia.

The following recommendations may be followed as a general procedure:—

Plant Cane.—Apply the appropriate Sugar Bureau planting mixture in the drill with the cane plants, and top-dress with sulphate of ammonia when the crop is stooling.

Ratoon Cane.—Fertilize with the appropriate Sugar Bureau ratooning mixture, in a furrow close to the cane stools. Top-dress with sulphate of ammonia when the ratoon shoots are 12-18 inches high.

Plant cane following a green manure crop will require no top-dressing with sulphate of ammonia, but ratoons always respond to this treatment. Early manuring ensures a vigorous crop, and pays better than late fertilizing.

Sugar Cane in New Guinea.

A. F. BELL.*

WE have recently been favoured with a visit from Mr. W. M. Pestell, of the Department of Agriculture, in the Mandated Territory of New Guinea, and it is thought that some of his remarks may be of more than passing interest to Queensland canegrowers. The opinion is held by botanists that sugar cane probably originated in two parts of the world, namely in India and New Guinea. The Indian canes are of the thin, hard type and are low in sugar content; New Guinea canes are of varied type, but heretofore interest has centred on the so-called "noble" type of which Badila, the Gorus and Mahona, are well-known representatives. Indeed the early collectors of cane varieties in New Guinea collected only the noble types of cane or, in other words, collected only those varieties which gave promise of immediate commercial value. In more recent years, with the expansion of cane breeding activities, attention has been also directed towards the "wild" low sugar types with a view to incorporating some of their vigour and hardiness in seedling canes.

Mr. Pestell is strongly of the opinion that much of the Mandated Territory of New Guinea is still unexplored from the cane variety standpoint and especially does he consider this to be so in the case of the so-called "uncontrolled" areas. This "uncontrolled" territory lies inland on the island of New Guinea and extends from the borders of Dutch New Guinea and Papua down to a line which runs roughly parallel to, and about 50 miles from, the coast. It therefore consists mainly of elevated land, rising from a height of about 600 feet above sea level to culminate in the 13,000 feet of Mount Hagon. Owing to this great range in elevation there is inevitably a great variation in climatic conditions. Sugar cane of various types is widely distributed, growing both naturally and under cultivation, and in places has been observed by Mr. Pestell growing at the astounding elevation of 10,000 feet.

Due, doubtless in part, to the cooler climate, the natives of the elevated lands appear to relish the energy-producing sugar, and they are more agriculturally inclined than the coastal natives; consequently, sugar cane is much more widely cultivated by them than by the natives on the coastal belt. For this reason, and the fact that hitherto "closed" territory is being made accessible, together with the development of aerial transport facilities, it is considered that these elevated lands offer a very promising field for cane collectors. Cane is found growing extensively on other islands, notably New Britain, and also on the coastal region of the island of New Guinea.

The cane is cultivated along with other crops in communal gardens by the natives, each village having one to several gardens situated in its vicinity. A village of 100 people may have some 15 20 acres under general cultivation, cane being a major crop at the higher elevations. The land is cultivated only for a period of 1-2 years and then a new site is selected. No irrigation is practised but the rainfall is well distributed, there being no distinct dry season. Varieties are collected during friendly

* In the "Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations, Dept. of Agriculture and Stock) for October.

visits or by raiding parties to neighbouring villages. As a rule the cane is planted in the form of setts but occasionally rooted plants are removed. Plants are not placed in furrows but have the earth heaped up in mounds above them; planting is generally done in an irregular fashion, but in some localities in the interior the stools are set out in rows and the fields squared up. Varieties may be mixed but on the other hand a village may grow only a single variety. Planting is carried out at any time of the year and is usually associated with ceremonial observances designed to propitiate the spirits and ensure the success of the crop.

The natives select the varieties to be grown mainly on their suitability for chewing and consequently there is a tendency to select low fibred canes which frequently have to be supported by bamboo frames. In this connection it is interesting to note that Badila is regarded as a comparatively high fibred cane! Dried strips of cane rind are used to line the native houses; the cane is split open, pressed under stones, the dried flesh pulled off, and the strips of rind then woven to form a coarse mat. The dried tops are used for bedding. In addition to chewing-cane, the " wild " type of cane is grown as a green vegetable, the young tops being cooked and eaten.

At least three types of cane have been observed; the well-known noble (Badila type) cane, the " wild " cane (thin, hardy and low in sugar) and the " robustum " type, a tall vigorous type which was first observed by the Brandes expedition in 1928. The robustum type is cultivated to some extent but also grows prolifically in the natural state, especially along the rivers. There also appear to be many hybrids and it is of great interest to note that two plants, identified at Kew as being cane-sorghum hybrids, were found growing naturally near Kaiapit, on the Upper Markham River, at an elevation of some 1,300 feet. Naturally growing canes may occupy considerable areas in some places and tracts of some 20-30 acres of an almost pure stand of sugar cane may be observed at times.

Arrowing is generally prolific, and is not confined to a restricted period as in Australia, but varies according to locality and elevation. Arrowing is apparently regarded by the natives as a symbol of maturity, as they frequently will not harvest the cane until it has arrowed.

No comprehensive pathological survey of sugar cane in New Guinea has ever been carried out, but Fiji disease and mosaic have been observed in many localities, the latter being most common in the very wet southern coastal districts of New Britain. Doubtless further surveys would reveal the presence of many more diseases of cane.

It is of more than passing interest to the cane breeder to reflect that these two diseases, and especially Fiji disease, have coexisted with sugar cane in New Guinea down through the ages without gaining the upper hand. It is obvious that in those regions of New Guinea where Fiji disease occurs, the indigenous canes must have very considerable resistance to the disease—otherwise they would have been wiped out ages ago. Now Fiji disease is of great potential importance in Queensland, and especially in Southern Queensland. It is very desirable and, indeed, necessary that the vigour of the noble canes be improved by crossing back to the wild hardy types, and we can see some of the results and possibilities of this procedure in the new P.O.J. canes, which are descended from a wild cane of the Dutch East Indies. Unfortunately, the introduction of

this particular strain of wild blood also confers great susceptibility to Fiji disease (and other diseases). It would appear logical, then, that other strains of wild canes should be sought for breeding purposes in regions where long association with Fiji disease has ensured their resistance to it. What applies to Fiji disease may also well apply to other diseases, such as downy mildew. It would therefore appear that the Queensland Sugar Industry, which already owes much to New Guinea, may well profit further by availing itself of the wealth of cane-breeding material still available in that neighbouring but yet largely unexplored island.

EFFECT OF WINDS ON CANE GROWTH.

The red soil area of the Bundaberg district is characterised by strong winds which blow freely throughout the year. The effect of strong winds on cane growth has been recorded in other cane countries, and the results are marked at the Bundaberg Experiment Station, particularly on the south-eastern corner which is devoted to cane seedlings.

Plate 290.
Depressed growth of outer rows of cane due to action of wind.

To overcome this trouble, a giant privet windbreak has been planted along the southern border of the Station, and is making excellent growth. It is hoped that the protection it will afford in a year or two will minimise the effects of south-easterly winds, which are the most serious.

The accompanying photograph shows very strikingly the effect of wind-blowing on the outer rows of cane of one of the Station blocks.

In passing, attention is directed to the crop of lupins on the left hand side of the illustration.

N.J.K., in the "Cane Growers' Quarterly Bulletin"
(Bureau of Sugar Experiment Stations).

Sooty Mould on Sugar Cane in the Babinda District.

DURING the past two years we have received a considerable number of reports from farmers in the Babinda area that their cane is being badly damaged by sooty mould. The symptoms of this so-called disease are probably familiar to most farmers; during dry weather the leaves, especially lower leaves, become covered with a black sooty deposit, causing the plants to present a dirty sick appearance; it will also be observed that this sooty deposit is worst in patches where the cane is stunted. Actually the cane is not diseased, in the strict sense of the word, although it is not claimed that no stunting results from the "suffocation" of the cane leaves by this sooty deposit.

On turning back the leaves of cane, especially stunted cane, growers may frequently observe colonies of a dirty yellowish aphid on the lower surface of the older leaves. This aphid is known as the cane aphid (*Aphis sacchari*) and as it feeds it secretes a sweet honey dew. The spores or "seeds" of a particular fungus fall on the leaves and germinate and grow in this rich, sweet honey dew without actually penetrating the cane leaf at all. The sooty coating may be rubbed off the leaf with the finger; it is exactly similar to the sooty mould which is so common on the leaves of citrus trees in North Queensland.

The cane aphid thrives during dry weather, and consequently with the advent of a long dry spell, the sooty mould also makes its appearance. On the other hand wet conditions very rapidly kill off the aphid population and the sooty mould disappears again.

Normally, cane aphids are found in appreciable numbers only on the lower older leaves of the cane, and hence the sooty mould which follows them can do little or no harm. However, during prolonged dry spells, and where the cane is already sickly and stunted, the aphid will be found feeding on quite young leaves, and so we soon get the appearance of the sooty mould on such leaves also. Although the sooty mould fungus does not attack the plant directly it seems obvious that it must cover up the leaf pores and cause still further stunting. That is to say the sooty mould does not start the cane on the downward path, but does "kick it when it is down."

It will be seen then that to avoid the effects of sooty mould it is necessary to rectify the cause of the stunting in the first place. During the past season several inspections have been made by members of the Division of Entomology and Pathology—and they have found that sooty mould is definitely worst on the low lands, and particularly so in local badly drained depressions. Although present the disease was very much less marked on the elevated red soils. The chief factors causing the initial stunting on the low-lying areas appear to be 1, inadequate drainage; 2, low fertility or high acidity; 3, chlorotic streak disease. The provision of adequate drainage needs no elaboration and the field officers of the Bureau are at the service of farmers for the purpose of taking soil samples for the determining of the correct fertilizer to be used or amounts of lime per acre required. Chlorotic streak is a disease which has been observed in Java, Hawaii, Puerto Rico and Australia, but its

cause still remains obscure. Experiments have shown us that it spreads fairly rapidly in the low-lying areas of the heavy rainfall districts of Queensland, but that it spreads very slowly, if at all, in elevated fields. If diseased cane is planted in a field on a red volcanic hillside, for example, the resultant plants will be diseased, but the disease does not spread into the adjacent healthy cane. Consequently, it follows that in the Babinda area it is bad practice to take cane plants from the river flats up to the hills but, on the contrary, it would help the control of this disease very considerably if the flats could be planted with selected cane from the hills. We say selected cane advisedly, since there is chlorotic streak disease in hillside fields which have been planted with diseased cane. The symptoms of chlorotic streak disease are only visibile in young cane and consequently cane which is to be used for plants in the autumn or spring of 1938 should be selected round about November-December of this year. Such inspections and the keeping of records as to the suitability of individual blocks for plants would require the services of a resident field officer which, unfortunately, the district does not possess. Healthy cane when planted on the flats will definitely contract this disease but the planting of healthy plants enables it to get off to a good start, and experiments carried out by the Bureau have indicated that a nett gain of some 25 per cent. may be expected in both plant and ratoon crops.

Two chlorotic streak-sooty mould resistance trials with over twenty varieties have been planted in the Babinda area this year, and their progress will be watched with interest

A.F.B., in the "Cane Growers' Quarterly Bulletin."

TO SUBSCRIBERS.

Subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Some Tropical Fruits.

No. 17. THE ROSE APPLE.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

THE Rose Apple is a member of the large family Myrtaceæ, and is a native of India and Malaya. The tree is of medium size and in this country is of bushy habit, making an ornamental specimen. The leaves are about 5 to 8 inches long by 1 to 2 inches wide and are thick and glossy. The young foliage is wine coloured; consequently a tree in young growth is very handsome.

The flowers are produced in terminal racemes on the smaller and younger branchlets. They are white with numerous long stamens which form the most conspicuous part of the flower, almost hiding all the other parts. The fruit grows up to 2 inches in diameter, and is usually round or sometimes slightly elongated. It retains the calyx segments conspicuously on the apex. When ripe it is of a creamy colour, and the flesh a light creamy pink. The ripe fruit is very similar to the common guava both in outside appearance and in texture of the flesh. The flesh is ¼ to ½ inch in thickness, and the large central seed cavity of the fruit contains one round seed about ½ inch in diameter, lying loose in the cavity.

The flesh is similar to that of the guava but is not so highly flavoured, and is much less palatable. The fruit has, however, the distinction of being very sweetly scented, comparable to a highly scented rose. It is this distinction that gives rise to the common name of the fruit. It also makes it popular in some countries as a table decoration. Although rather poor as a dessert fruit it is said to be delicious in the preserved or crystallised form.

The tree is now largely distributed throughout tropical countries. It was probably introduced to Queensland about forty years ago and is now growing well in the tropical part of this State, although at the present time only in limited numbers. The ideal conditions for its

growth are a moist and warm climate, with a good, deep, loamy soil, but it seems to be fairly hardy and will thrive under much less congenial conditions. In fact, Popenoe reports that in America it grows on sandy soils and in subtropical climates. However it is, strictly speaking, a tropical fruit.

In Queensland the tree blomms from July to October, and the fruit is in season between September and Christmas. The tree is not a heavy cropper however.

Plate 291.
Flowers and Ripe Fruit of the Rose Apple.

Propagation of the Rose Apple is usually by seed, but P. J. Wester has found that in the Philippines it may be propagated by budding. If a particularly good specimen should be located propagation by this method would be advisable, but the general type met with does not warrant it.

Botanically the tree is known as *Eugenia* jambos (L.), sometimes *Caryophyllus jambos* (Stokes) or *Jambosa vulgaris* (D.C.). The common name of Rose Apple is adopted in most English-speaking countries; Jambu is used in India and Malay; Yambo, Yambosa, Tanpul, &c., are various names applied in different parts of the Philippines.

Sawdust Packing for Grapes.

JAS. H. GREGORY, Instructor in Fruit Packing.

IN the past, when exporting Australian grapes overseas it has been necessary to use granulated cork as a filler. For many years Australia has been importing grapes packed in sawdust from California during the off season. For a long time, a search for a suitable sawdust has continued in Australia. The main difficulty has been in overcoming wood taint which was absorbed by grapes stored for lengthy periods necessary during storage and transport. Various kinds of sawdust have been used without success, but at last a treated type of sawdust has been obtained which, when packed with grapes and stored for eighteen weeks, left them taint-free. The wood used was Queensland hoop pine.

Another difficulty has been to obtain the size and shape of granule in the sawdust, but with the co-operation of officers of the Queensland Forest Service this has been overcome. Only certain types of saws will throw off a suitable sawdust comparable with the sawdust used for fruit packing in America. For the present, however, only a limited quantity of this sawdust is available. The price, in consequence, is so high that a comparison of the value and the quantity required for a case with that of cork is not favourable enough, for the time being, to warrant the general adoption of sawdust. The cause of this is the very low recovery of sawdust of the required coarseness from the special saw in use. This sawdust is actually finer than that used in America.

Past experience of the use of cork leaves one with the opinion that it might be possible to use a finer type of dust-free sawdust for packing. This would mean a far greater recovery, and therefore a substantial decrease in price. To ascertain definitely if this is possible, further experiments are to be conducted during the coming season. In the meantime, growers are advised not to rush into using any type of sawdust which may be obtainable in their districts without first subjecting it to exhaustive tests as to its suitability for packing and freedom from taint. The sawdust used experimentally was carefully sieved to remove the finest particles, and then carefully dried until only a 12 per cent. moisture content remained. American sawdust is obtained from timbers such as redwood, spruce and Douglas fir. Investigation will probably show that many Queensland timbers can be used for sawdust for fruit packing if treated correctly. Unless definite taint-free dusts are obtainable, great damage might be done to the grape export trade by the use of unsuitable sawdust. It only needs one or two consignments to show signs of taint, and arguments similar to those that arose in respect of butter boxes will immediately be used.

A short account of the experimental test follows:—

Two cases of Servante grapes were packed on the 22nd March, one with cork and the other with sawdust. These were placed in Messrs. Birt & Co's. cold store under the usual trade conditions. The object was to ascertain the extent of the presence of taint, if any, in the sawdust, and also make a comparison between the merits of the sawdust and cork from the following viewpoints:—

(*a*) Taint;

(*b*) Breakdown of fruit;

(*c*) Adherence of packing material to fruit.

The following observations were made:—

(*a*) *Taint.*—With the cork-packed fruit a slight musty corky flavour was noticeable, due no doubt to a minute covering of the fruit with very fine dust. With sawdust no taint was noticeable in the sound fruit, but a few damaged berries had a faint wood taint, caused possibly by the damping of the wood with the fruit juice.

(*b*) *Breakdown of Fruit.*—The fruit in cork definitely showed greater breakdown. A few cases of "nests" of rotting berries were observed. There was a much greater incidence of mould development noticeable on those in the cork filler. The sawdust pack did not show any tendency towards developing "nests" of unsound fruit.

(*c*) *Adherence to Fruit.*—Sawdust definitely does not adhere to the fruit in the same way as the cork. Apparently, it can be cleaned of fine dust better than cork. This causes the bunches to open up much fresher in appearance. Sawdust-packed fruit also maintained better its natural bloom on the skin, looking quite fresh in comparison with the fruit packed in cork.

The weight of sawdust used to the case was approximately 9 lb., as compared with 4 to 5 lb. of cork. These weights would, of course, vary with the type of bunch used for packing, so can only be taken as an example. With the present price of cork at 4½d. per lb., the total cost of packing a case would average about 1s. 6d.

The fruit used was handled in two different ways. One section was picked on Friday morning, 19th March, the other section about 5 p.m. on Saturday, 20th March, a difference of approximately 30 hours before packing. When taken from the case, six weeks later, no appreciable difference could be observed in the appearance of the fruit of either lot. Stalks were slightly shrivelled in both lots. The Servante variety, on account of its tendency to tight bunches, is not altogether a satisfactory type for storage and long transit—the tightness of the fruit making it difficult to trim out the slightly damaged berries which are the causes of "nests" of rotted fruit. These "nests" in the case of this experimental fruit, consisted of up to five berries each.

To ascertain the extent of time available for retailers to handle these grapes when removed from storage, bunches were removed from the sawdust and cork and stored under ordinary room climatic conditions. At the end of four days the bunches were still good in appearance, but at least 20 per cent. of the berries were dropping from their stalks. Bunches left untouched in the packing material were in better condition when removed than those removed the first day, showing an approximate 10 per cent. fall of berries. From the commercial point of view, this is fairly satisfactory.

In analysing these results, it must be remembered that before the harvesting of this fruit very heavy rains were experienced, to the detriment of the keeping qualities of the grapes.

In addition to this, a case of Purple Cornichon grapes was packed on the 5th April, containing two sections, one packed in cork and the other in sawdust. This fruit was displayed in the fruit section in the court of the Department of Agriculture and Stock during the last Brisbane Exhibition, having been 10 days out of cold storage before the fruit was unpacked. The following observations were made:—

By the end of the exhibition, the grapes had started to show signs of shrivelling with both types of filler.

The fruit in sawdust was definitely in better condition than that in cork.

The fruit packed in cork had a tendency to show "nests" of decayed fruit; the sawdust pack was comparatively free from this fault.

No signs of taint could be noticed in the fruit packed in the Queensland sawdust, but the cork-packed fruit had a very slight musty flavour.

Berries in both packs had reached their limit of storage, and showed a marked tendency for dropping from the stems.

ACKNOWLEDGMENT.

An acknowledgment is due to officers of the Queensland Forest Service for their co-operation in obtaining and treating suitable timber; to Messrs. Birt & Co. for cold storage facilities and attention; and to Mr. R. L. Perkins, of Ballandean, for making the fruit available.

THE CONTROL OF THE RED-SHOULDERED LEAF BEETLE.

N. E. H. CALDWELL, B.Sc., Agr., Assistant Research Officer.

The red-shouldered leaf beetle has again made its appearance this spring, notably on citrus orchards in the Maroochy district, where it has been damaging flowers and foliage to a serious extent. In recent trials, dusts containing either or both pyrethrum and derris as toxic ingredients were used on citrus trees carrying a fairly heavy infestation of beetles. The results with pyrethrum were particularly satisfactory. There was an almost complete drop of semi-paralysed beetles within a few minutes, and observations suggested that only a very small proportion of these recovered sufficiently to fly or to climb the trunks of the trees.

Growers are, therefore, recommended to combat this pest by the use of a pyrethrum dust. If pure pyrethrum is purchased, it can be mixed with equal parts by weight of kaolin (a cheap filler) to reduce the cost of the treatment. As derris is somewhat slower in action and considerably less effective against this pest than pyrethrum, dusts containing the former insecticide alone cannot as yet be recommended for the control of the red-shouldered leaf beetle.

Dusting should be done in the early morning when the beetles are relatively sluggish and less apt to fly away when dusted. The lower temperatures prevailing at an early hour do not appear to impair the efficiency of the dust.

Dusting should be thorough and, in the case of a large tree, should be done both inside and outside the tree. Each insect must come in contact with the dust, either directly as it comes from the duster or indirectly as the beetle moves over foliage carrying a layer of dust. It is not necessary, however, to use excessive quantities of the dust. A fine cloud of dust passing through the tree is all that is required.

A number of beetles will be observed, in the early mornings at least, on any weeds under the trees. These should also be treated. In any case, some little time after the tree has been dusted, the beetles which have fallen to the ground should be given a light dusting to make sure that every one receives a lethal dose of the poison.

This method of dealing with a pest that has for years been a periodic worry to growers of many crops is easy to apply, effective and reasonably cheap.

Strawberry Culture.

W. G. HANCOCK, Fruit Branch.

At the present time, two strawberry cultural matters are due for consideration: (1) The treatment of old beds for next year's crop; and (2) Runner production for next year's planting.

The peculiarities of the strawberry in forming new main roots from higher parts of the stem is often overlooked, but nevertheless it is a very important characteristic which should be taken into account. The cultivated strawberry has inherited this habit from its woodland ancestors, which every year after cropping in the summer were half buried by the autumnal fall of leaves from the trees above them. Thus, after the strain imposed upon the plants by the crop, they are annually re-invigorated by the leaf mulch.

In applying this to Queensland, it requires to be kept in view that, under European conditions, the strawberry fruits in the summer and rests during the winter; while here it fruits during the winter, and subsequently undergoes, to it, very trying conditions during summer. In addition, therefore, to providing a medium to support the freshly-forming roots, a thick mulch will keep the top of the soil cooler and moister during the summer, and thus help to offset the rigours of a sub-tropical summer on a temperate plant: The result will be stronger plants for next year's crop, and better and stronger runners for next year's planting.

On the question of runner production for next year's planting, in most countries what is referred to as runner deterioration has been noted, and an improvement in the quality of plants with a view to arresting this tendency has been sought.

It has been definitely confirmed that a restriction in the number of runners per plant results in the production of better runners for planting out, and better fruit production. Five should be the general rule. An authority goes so far as to recommend that (1) a special bed be planted for runner production; (2) after the plants have become established, all weak diseased or abnormal plants be pulled out; (3) pick off the blossoms as they form; (4) allow five runners to each plant and stop after the first runner plant.

Strawberry growers would do well to give these recommendations a trial next year. Meanwhile, measures should be adopted to keep the plants strong and healthy with the object, firstly of having the old plants in better shape next year for cropping, and, secondly, to encourage the formation of strong runners for future planting. These consist of (1) clean-up and cultivate old beds; (2) fertilize; (3) draw up the soil to the plants and mulch with leaf mould or litter; (4) restrict the runners to five and stop after the first runner; (5) keep the beds free from weeds and irrigate when necessary, so that the plants shall not suffer from lack of moisture.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE recent heavy rains have been a welcome relief to all engaged in fruitgrowing. Localities near Brisbane have, however, had too much wet weather for some crops, especially tomatoes. From now until the end of the month, good quality tomatoes should maintain firm values. Stone fruits have also been affected adversely by the weather. Growers of stone fruits are advised to use the direct factory outlet for as much as possible, and so assist in avoiding an oversupply. Fruit sent to market and withdrawn later for factory use has the tendency to cause prices to ease. Direct consignments assist in obviating the chance of difficulties of this sort arising.

Prices at the end of November:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish—sixes, 4s. 6d. to 9s. a tropical case; sevens, 5s to 12s.; eights and nines, 6s. 6d. to 12s. 6d. Bunches—Cavendish, 1½d. to 5d. per dozen; Lady Fingers, 4d. to 9d. per dozen.

Sydney.—Sixes, 10s. to 16s.; sevens, 16s. to 19s.; eights and nines, 19s. to 22s.

Melbourne.—Sixes, 12s. to 15s.; sevens, 15s. to 17s.; eights and nines, 17s. 6d. to 19s.

Pineapples.

Brisbane.—Smoothleaf, 7s. to 10s. per case; loose, 2s. to 8s. per dozen. Ripleys, 9s. to 11s. per case; loose, 1s. 6d. to 7s. per dozen. Some nice northern fruit has been seen on the local market.

Sydney.—8s. to 12s.

There are reports of leaky fruit on both Melbourne and Sydney markets.

Melbourne.—10s. to 16s.

Growers are warned to note that pineapples at the present time are ripe when showing very little colour. They should notify their agents to this effect.

Papaws.

Brisbane.—Yarwun, 8s. to 10s. a tropical case; Gunalda, 5s. to 6s. a bushel case; Locals, choice, 3s. to 5s. a bushel case.

Sydney.—10s. to 14s. per tropical case.

Melbourne.—10s. to 14s. per tropical case.

Mangoes.

Brisbane.—5s. to 8s. per case.

Sydney.—6s. to 8s. per case; selected types higher.

Melbourne.—Half-bushels, 5s. to 7s. Only selected types should be sent to the Southern States.

Passion Fruit.

Brisbane.—First grade, 7s. to 10s. per half-bushel; seconds, to 6s.

Sydney.—8s. to 18s. per half-bushel.

Melbourne.—12s. to 20s. per half-bushel.

CITRUS FRUITS.

Oranges.

Brisbane.—8s. to 10s. per case. Second crop fruit practically unsaleable.

Lemons.

Brisbane.—Gayndah, 10s. to 14s. per case; Byrnestown, 14s. to 15s. per case; Locals, 6s. to 9s. per case.

STONE FRUITS.

Peaches.

Brisbane.—Stanthorpe peaches are now in season. The quality appears to be an improvement on early consignments of past seasons.

China Flats, 1s. to 2s. per tray; specials higher.

Stanthorpe Mayflower, 4s. to 6s. per half-bushel.

Plums.

Brisbane.—Stanthorpe Wilsons, 2s. to 6s. per half-case; New South Wales Wilsons, 2s. to 5s. per half-case; choice grades higher.

Cherries.

Brisbane.—Stanthorpe, 7s. 6d. to 9s. per case; New South Wales, 6s. to 8s. per case.

Many lines opened wet, apparently through being packed and nailed down during adverse conditions.

Apricots.

Brisbane.—Warwick, 4s. to 8s. a half-bushel; Stanthorpe, small varieties, 4s. to 7s. per half-bushel; choice, 8s. to 10s. per half-bushel.

As Brown Rot is likely to develop rapidly under the present climatic conditions, growers should take all care to see that possible skin damage is reduced to a minimum. The use in the packing shed of a solution of 1 part of formalin to 20 parts of water as a cleanser is suggested. Picking and packing utensils should be sprayed with or dipped in this solution at least once a week.

Tomatoes.

Because of weather conditions the quality has fallen off. Only firm lines are wanted on the markets, soft fruit being almost impossible to sell.

Brisbane.—Ripe, 1s. to 3s. per half-bushel; green, 2s. to 3s. 6d.; coloured, 2s. 6d. to 4s. 6d.; few specials higher.

Sydney.—Queensland, 1s. to 3s. 6d. per half-bushel. Market over-supplied.

Canteloupes.

Brisbane.—5s. to 8s. per dozen, only light supplies available.

Sydney.—5s. to 8s. per bushel.

Melbourne.—8s. to 10s. per bushel case; some higher.

Apples.

Southern shippers are warned not to send apples to this market, except Yates and Crofton, or similar hard varieties. Many lines are now opening up soft and do not keep.

Brisbane.—Yates, 5s. to 10s. 6d. per case; Crofton, 7s. to 10s. 6d. per case; Democrat, 5s. to 9s. per case.

Pears.

Winter Coles, 10s. to 16s.; Winter Nelis, 9s. to 14s. per case; Josephine, 11s. to 14s. per case.

VEGETABLES.

Marrows.

No demand on any market; prices in Melbourne and Sydney unpayable.

Brisbane.—6d. to 2s. per dozen.

Sydney.—2s. to 4s. a tropical case.

Melbourne.—4s. to 5s. a tropical case.

Cucumbers.

Brisbane.—1s. to 2s. per bushel case.

Sydney.—1s. to 5s. Market over supplied.

Melbourne.—2s. to 5s. per bushel.

Peas.

Brisbane.—4s. to 6s. per bag.

Beans.

Brisbane.—6s. to 8s. a sugar-bag.

Lettuce.

Brisbane.—1s. to 1s. 6d. per dozen.

Cabbage.

Brisbane.—3s. to 5s. Inferior lower.

Chocos.

Brisbane.—9d. to 1s. 3d. per dozen.

PUBLICATIONS.

"Passion Fruit Marketing" is now available. "Tomato Marketing" is in the hands of the printer.

CHRISTMAS TELEGRAMS.

The Deputy Director, Posts and Telegraphs (Mr. A. B. Corbett), advises that arrangements have been made for Christmas and New Year greetings, sent by telegraph between the 20th December and 6th January, to be delivered on appropriately designed and coloured telegraph forms enclosed in pleasing and attractive envelopes.

These greeting messages should be written on the usual telegraph forms and lodged at any telegraph office, the word "Greeting" being added at the top of each form used. Telephone subscribers may send their greetings by means of the Phonogram Service. No additional charge is made for greeting telegrams—the usual telegraphic rates apply.

Greeting telegrams are also being accepted for transmission to places abroad at reasonably low rates, particulars of which may be obtained at any Post Office.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of October, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard 350 lb.).				
Villa Maria Broady 5th	W. Henricksen, Ardilea, Clifton	9,273·0	459·688	Villa Maria Sir Charles
Junior, 3 Years (Standard 270 lb.).				
Morden Nessie	W. Henricksen, Clifton	7,047·75	271·246	Morden Stirling
Senior, 2 Years (Standard 250 lb.).				
College Granny 5th	Queensland Agricultural High School and College, Lawes	6,156·3	259·468	Duplex of Greyleigh
Junior, 2 Years (Standard 230 lb.).				
Alfa Vale Beauty II.	W. Henricksen, Clifton	7,361·25	280·428	Reward of Fairfield
College Flash 2nd	Queensland Agricultural High School and College, Lawes	6,022·95	231·948	Duplex of Greyleigh
JERSEY.				
Junior, 4 Years (Standard 310 lb.).				
Glenview Blossom	W. S. Kirby, Byrnestown	4,677·9	292·092	Glenview Goldfinder
Senior, 2 Years (Standard 250 lb.).				
Inasfayl Dark Flower	McGeehan Bros., Kairi	6,683·45	312·852	Oxford Royal Renown
Junior, 2 Years (Standard 230 lb.).				
College Linda	Queensland Agricultural High School and College, Lawes	4,297·94	234·761	Belgonia Peggy 9th's Duke
FRIESIAN.				
Junior, 2 Years (Standard 230 lb.).				
Ryfield Favourite 2nd	F. C. Noller, Kumbia	6,318·65	263·837	Ryfield Argus 2nd

The Tropics and Man

Mental Capacity.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 5.

THIS aspect of tropical residence is one that naturally concerns an academic mind, but it is really of equally vital concern to every tropical dweller. None of us works with hands alone, and all our work goes for little unless part of a well-reasoned plan. The capacity of the individual to think for himself is as important as that of the organiser, particularly in the existing democratic state.

Handicaps upon the Nervous System.

It will be clear to you by now that the nervous system is placed at a certain disadvantage in hot climates by reason of a less reliable blood supply and by the threat of water deficiency within the body. There are probably other less obvious changes in hot climates which also affect the nervous system. The nerve cells are probably susceptible to changes in the blood a thousand times smaller than those we can measure by present means. To investigate these by modern methods is like fixing a watch with a crow-bar. The nerve-cells are susceptible especially to the secretions of the ductless glands, and there is a good deal of evidence that the balance of these glands is altered in hot climates.

Common Results.

Irritability is very common in tropical dwellers, particularly towards the end of a long spell of trying weather or hard work. In certain countries almost universal irritability, mounting frequently to uncontrollable anger, habitually follows a hot dry wind (mistral, foehn, sirocco). On the other hand, many mental disturbances have been attributed to climate when there is really some other cause. The "amok" of the Malaysian is probably due, for instance, to cerebral malaria.

Sleeplessness is also common, particularly in coastal areas when the night-time conditions are little better than the day-time. The necessary mosquito-net effectively cuts out what breeze is going and makes matters worse. This very real and common handicap can be partially overcome by using a net with a large upper surface made of netting, not calico, and by fixing a fan above the net. The fan should run at the lowest speed, and should be kept sufficiently distant to avoid draughts upon the sleeper.

Lack of concentration must be familiar to all who indulge in critical brain work. There is unwillingness to fix the mind and an inability to grasp details easily. The fatal spirit of manana ("to-morrow") steals in so unobtrusively that its presence is not realised until it is firmly established. It is only the strongest mind that can resist these changes, and then all too frequently at the expense of the bodily health.

Boredom is a very similar process, and is especially noticeable in equatorial islands where the climate hardly varies from one year's end to

the other. The greater part of tropical Australia is fortunate in having distinct seasons, at least in respect to man's personal life. The same alternation of seasons brings difficulties, however, to agriculture, particularly in the Northern Territory.

The reactions to these mental handicaps are sometimes excessive, and may then become anti-social. The terrific drinking and loose-living beloved of tropical writers (some of whom do not know the difference between mango and mangrove) is grossly exaggerated. Nevertheless, there is, I think, a greater tendency to turn to alcohol and other diversions in hot climates as an escape from boredom, insomnia, and isolation. Where the line is to be drawn between legitimate diversion and excess is a matter for individual opinion; but there can be no doubt, I think, that there is a drift away from the moderate towards, if not actually to, the excessive in tropical climates.

Mental Production.

Can mental work in the tropics reach the same quality as mental work in temperate countries? Can there be the same quantity of good mental production in the tropics? Is an attempt at maintaining temperate standards harmful to the body?

That mental activity of outstanding quality can be carried out in the hottest of climates and under the most unpromising conditions is quite clear, as the history of tropical medicine shows. This branch of medical science has been fostered by a host of brilliant men working under these very conditions; such famous names as Manson, Bruce, Rogers, Findlay, immediately spring to mind.

That the quantity and continuity of such work could be maintained, or that the good average brain-worker as distinct from the genius, could be as successful under tropical conditions is another matter. To compare the intellectual output of, say, Queensland and England, is not a fair test. Although the position is now rapidly improving, Queensland flowers all too often bloomed unseen by the rest of the world, or else were transported to England or America and quickly absorbed into and reckoned as part of the horticultural displays of those countries. I know of five very well-known English medical men who are, in reality, Australian products.

In view of the very frequent signs of interference with mental activity in the tropics, I doubt whether temperate standards of intellectual production can be maintained in quantity, at any rate by us ordinary mortals. Having worked successively in England, Signapore, and Brisbane, I have no illusions as to the relative productivity in my case, nor as to the relative effects of winter and summer months. Under emotional stress the mental activity may be artificially maintained for a while, but it usually turns out to be at the cost of general bodily efficiency and health.

Stabilisation.

Undoubtedly, one can make or neglect to make the best of circumstances. As I have suggested, even under the best of circumstances, I doubt whether one can realise one's full mental capacity in hot weather. It is very important, therefore, that all possible factors should be controlled to give the best working conditions. These improvements fall under four headings. If observed, they should minimise tropical interference with mental activities.

(1) *An Ordered Life.*—Nowhere is it more essential deliberately to arrange one's life for the best. A sufficiency of the best food (not necessarily the dearest, by an means), plenty of fluids, regular exercise, adapted to the body's requirements, periods of mental and physical relaxation definitely set aside and conscientiously observed, and good living conditions are essential. The degree to which one can abuse one's bodily and mental requirements with impunity is very much diminished in hot climates.

2. *Fixed Interest.*—Undirected amateurish mental pottering quickly degenerates into mental idleness. A definite interest must be created and a goal set up. The objective must be maintained even if, as will almost certainly be the case, a certain amount of flogging is needed to keep oneself up to it. The setting aside of definite times and the mapping out of a programme are very useful tricks for setting the pace. The only thing is, to set a reasonable pace, which will generally be a bit slower than the pace usual to temperate countries.

3. *Keeping up Contacts.*—Isolation is a great handicap to mental work in many tropical places, and often a danger. Deliberate attempts must be made to keep up contacts with other parts. This is now becoming easier by reason of air mails.

4. *Regular Holidays.*—A system of regular holidays is essential to the brain-worker. The advantages are two-fold—a relief from tropical stresses and an opportunity to re-establish contacts with fellow workers.

THE COMPOST HEAP.

One of the most economical methods of gaining good growth in the orchard is with the contents of the compost heap. Besides supplying a readily available plant food, the condition of the soil will be greatly improved by the added humus. It is surprising to note the variety of waste substances which can be put to profitable use in the compost heap. Farmyard manure, straw, weeds, dead leaves, and, in fact, almost all organic substances, both animal and vegetable, may be used. The size of the heap will be regulated by the quantity of material available from time to time, but provision should be made for a second heap so that the first heap may be topped off with a layer of soil and left to mature, from three to four months usually being sufficient for the process of conversion. In this way, a continuous supply of humus will be available.

If practicable, the heap should be built on a concrete base and framed with saplings. After each collection of refuse is added, dust the heap with lime and add a layer of earth. The heap should be kept in a moist condition. Overheating may be avoided by the use of more earth, which will absorb the ammonia given off in the process of fermentation.

When it is realised that the compost heap uses materials which would otherwise be wasted and converts them into a very valuable manure, it is a pity that its use is not more general.

The Apiary

As the season advances, the super combs will become capped over and are then ready to be taken off for the purpose of extracting the honey. The beekeeper will require to exercise some judgment as to when the honey is ripe enough to extract. Coastal districts, especially in heavily-timbered areas, are remarkable for the dampness of the atmosphere. In these districts it is a very safe plan to permit the cappings of the honey to extend over the entire comb face before removing it from the hive. Even then, the honey in these wet districts is of a rather thin character; in fact, it is almost impossible to attain the density of honey gathered from inland localities. On the other hand, in dry and hot localities the nectar ripens quickly, and the combs are ready to extract when the capping covers approximately half the comb face. Indeed, inland honey occasionally becomes so dense that considerable difficulty is experienced in extracting it. This sometimes occurs when a cold change, without rain, follows hot weather with a good honey flow. Unless it is unavoidable, honey should not be taken off when the weather is cold, as it will then be necessary to store the combs for a few days in a warm room in order to extract the honey.

There are machines on the market for ripening honey, but the majority of beekeepers leave the honey in the hives in preference to the artificial process. At times the honey flow is so heavy that the super is soon filled with unsealed honey. If the beekeeper now neglects to supply further storage room, the bees will almost invariably store honey in the brood-combs and crowd the queen for egg room. This is the chief cause of swarming at any season of the year. It also causes the bees to build a number of burr combs on the tops, sides, and bottoms of frames, making their removal a test of patience. Should the bees fill the super before any of the honey is ripe, it is advisable to furnish yet another super of foundation.

In order to improve the appearance of newly-extracted honey, it is a good plan to lay a piece of fine mesh cheese-cloth over the wire strainer of the tank. Although it causes the honey to be slow in passing through, it will catch a greater proportion of the scum. This is comprised of small particles of wax, pollen, and also air bubbles that have been forced through the honey during extraction. The honey should be permitted to stand in the tank to settle for a week when any remaining scum may be skimmed off the surface, after which the honey may be run into tins or bottles for market.

THE DAIRY FARM.

Large paddocks on a dairy farm are not economical. If practicable, the farm should be subdivided into a number of small paddocks, which allows for each to be grazed in turn, and then spelled for a period to enable the paddock to recover. Large paddocks often mean fodder wastage, as cattle roam all over the area, eating out the choice grasses and fouling the remainder, making them unfit for food.

A lot of waste results from faulty management of good pastures by stocking too heavily, which means, of course, that good grasses are eaten up quickly. If the paddock is spelled for a reasonable period, the pasture gets a chance to recover and the grasses have time to seed.

Unwise feeding methods constitute a prolific source of waste. It is necessary to balance the ration so that there will be no waste or loss in production through feeding an excess of one food constituent at the expense of another.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

A Common Weed. Hexham Scent.

J.J.S. (Helidon)—

1. *Fumaria parviflora*, the fumitory. A moderately common weed in Queensland. It is not known to possess any poisonous or harmful qualities.

2. *Melilotus indica*, melilot or Hexham scent. This plant was "boomed" as a fodder in Australia some years ago under the name of King Island melilot, but our experience in Queensland has been that stock do not take very readily to it, and have to become accustomed to its peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during spring, dying off at the approach of hot weather towards the end of October or early November. As a fodder plant for Queensland for winter and spring months it is poor compared with some of the annual trefoils and clovers, such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread made subsequently.

Burr Grass. Chinese Burr. Chaff Burr.

T.G. (Cathu, North Coast Line)—

1. *Cenchrus australis*, burr grass. A native grass very common on scrub edges, hillsides, and similar places throughout the whole of coastal and near-coastal Queensland. It is very common in some pastures in North Queensland and on the Atherton Tableland is known by the rather absurd name of Scotch lice.

2. *Triumfetta bartramia*, Chinese burr.

3. *Achyranthes aspera*, chaff burr. So far as is known there is no easy method of getting rid of this plant. Frequent cutting, of course, will eventually exhaust them with the exception of the grass.

Numbers 2 and 3 probably would succumb to weak arsenical solutions or spraying with Weedex. Weedex would be preferable, as it is not known to be harmful or poisonous to stock in the weaker solutions used for weed poisoning. The Agricultural Chemist, Department of Agriculture and Stock, Brisbane, will give you the suitable strengths of the various poisons used.

Kangaroo Apple.

W.H.G. (Goondiwindi)—

Your specimen has been identified as the kangaroo apple, *Solanum aviculare*, a native plant and a weed of new burns, although it is not, of course, confined to such country. The berries are poisonous. The plant is generally left untouched by stock, but it is recorded that the young shoots, when nibbled by sheep, have caused death.

Dog Burr.

D.G. (Kangaroo Point)—

The specimen is *Bassia tricuspis*, a close relative of the galvanised burr and the black roly-poly of Central Queensland. The only local name we have heard applied to it is Dog Burr. It is very common in parts of Queensland, particularly in the Western Darling Downs and Maranoa districts, but we have received specimens from as far north as Clermont. It is a native plant and, apart from its burr nature, is not known to possess any poisonous or harmful properties.

South Burnett Plants Named.

F. (Leafdale, Wondai)—

1. *Silybum Marianum*, the variegated thistle, a very common thistle on the Darling Downs and in the Southern States. It has been thought at times —when eaten in large quantities—to have caused the death of stock, particularly sheep, but this has not been verified by feeding tests.
2. *Argemone maxicana*, Mexican poppy or prickly poppy. This weed is known under various local names, such as silver thistle and Californian thistle. It is, however, a member of the poppy family and not a true thistle. It is reputed to be poisonous, but is rarely touched by stock as, in addition to its spiny nature, it possesses an extremely bitter sap.
3. *Centaurea melitensis*, star thistle or Maltese thistle.
4. *Carthamus lanatus*, saffron thistle.

Nos. 3 and 4 are two very common thistles in the Southern States, much more abundant there than in Queensland, but both, particularly No. 4, seem to be on the increase. All the abovenamed are annual plants and call for no special methods of eradication, other than those usually employed in cultivation.

5. *Physalis lanceolata*, ground cherry or wild gooseberry. This plant, a native of North America, has been observed in several places in Queensland, particularly on the Darling Downs. It is a much more serious pest than any of the others you have sent. The Council for Scientific and Industrial Research have it on their list of weeds for investigation. The only method of control, so far as we know, is to keep the green shoots regularly cut off as they appear above the ground so as to exhaust the old roots eventually. If preferred, they could be periodically destroyed by spraying. This would have to be done several times as these plants have an underground stem system. Poison is not always effective on such plants—simply "burning off" the tops and leaving the parts unnder the surface to send out fresh shoots. Every effort should be made to keep it within bounds, and not let it spread by means of seed or pieces dropped here and there.
6. *Polygonum convolvus*, climbing buckwheat. Much the same remarks apply to this as to Nos. 1 to 4.

"Red Head" or Red Cotton Bush.

M.R.I. (Rockhampton)—

The specimen has been identified as the red head or red cotton bush, *Asclepias curassavica*. 8his plant is poisonous to stock and, among other symptoms are those of gastro-enteritis. However, in normal seasons, the plant is generally avoided by stock.

The Age of a Horse.

A.W. (Sarina)—

The following verses are printed in compliance with your request for a convenient form of memorising ways of telling the age of a horse:—

To tell the age of any horse,
Inspect the lower jaw, of course;
The six front teeth the tale will tell,
And every doubt and fear dispel.

Two middle nippers you behold
Before the colt is two weeks old;
Before eight weeks, two more will come,
Eight months the corners cut the gum.

The outside grooves will disappear
From middle two in just one year;
In two years from the second pair—
In three years "corners" too are bare.

At two the middle "nippers" drop;
At three the second pair can't stop;
When four years old the third pair goes,
At five a full new set he shows.

The deep black spots will pass from view
At six years from the middle too;
The second pair at seven years,
At eight the spot each corner clears.

From middle "nippers" upper jaw,
At nine the black spots will withdraw;
The second pair at ten are bright,
Eleven finds the corners light.

As time goes on the horsemen know
The oval teeth three-sided grow;
They longer get, project before,
Till twenty—when we know no more.

General Notes

Staff Changes and Appointments.

Mr. A. Nagle, Senior Instructor in Cotton Culture, has been transferred from Rockhampton to Biloela.

Mr. K. D. Hoffmann, Inspector, Diseases in Plants Acts, has been transferred from Dayboro to Nambour.

Messrs. S. C. O. Jessop and E. T. Lewin, Inspectors of Stock at Toowoomba and Dalby, respectively, have been appointed also inspectors under the Dairy Produce Acts.

Mr. H. Spottiswood, Clerk of Petty Sessions, Ayr, has been appointed also chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards, and also an agent of the Central Sugar Cane Prices Board for the purpose of making inquiries under Section 5 (2A) of the Regulation of Sugar Cane Prices Acts in regard to sales and leases of assigned lands.

Mr. O. St. J. Kent, B.Sc., A.A.C.I., Analyst, Agricultural Chemical Laboratory, has been appointed Senior Dairy Technologist, Dairy Research Laboratory.

Mr. W. G. McKechnie, A.A.C.A., Analyst, Agricultural Chemical Laboratory, has been appointed Assistant Senior Analyst, Agricultural Chemical Laboratory.

Mr. H. W. Ball, Assistant Experimentalist, has been appointed Experimentalist and Senior Clerk, Agriculture (General) Branch.

Mr. A. A. Salmon, Clerk, Chief Office, becomes Assistant Photographer, Publicity Branch.

Mr. S. C. Mossom, Court House, Innisfail, has been appointed chairman of the Goondi, Mourilyan, South Johnstone, and Tully Local Sugar Cane Prices Boards, and also an agent of the Central Cane Prices Board for the purpose of making inquiries under Section 5 (2A) in regard to sales and leases of assigned lands.

Constable C. H. Lowe (Mount Morgan) has been appointed also an inspector under the Brands and Slaughtering Acts, and Constable A. Bartkowski, of Westwood, has been appointed also an inspector under the Slaughtering Act.

The following appointments have been made in the Department of Agriculture and Stock:—

Division of Plant Industry (Research).

Mr. J. Harold Smith, M.Sc.Agr., Entomologist, has been appointed Senior Research Officer, Entomological Section

Mr. R. E. Soutter, Agricultural Research Officer, to the position of Senior Research Officer, Agricultural Section.

Mr. W. A. T. Summerville, M.Sc., Entomologist, Science Branch, to be Senior Research Officer, Horticultural Section.

Mr. H. K. Lewcock, M.Sc. (U.S.A.), B.Sc.Agr. (Adel.), Pathologist, to be Senior Research Officer, Plant Physiology Section

Mr. W. D. Francis, Assistant Botanist, to be Botanist, Botanical Section.

Wild Life Preservation.

An Order in Council has been issued under the Animals and Birds Acts extending the boundaries of the present sanctuary embracing Bald Hills Paddock and Nulla Waterhole on Salisbury Plains Station, in the Bowen district, and including the property adjoining belonging to Mr. A. Jensen.

An Order in Council has been issued under the Animals and Birds Acts, declaring an area embracing Macintyre Brook, Glenelg Station, Inglewood, to be a sanctuary for the protection of animals and birds.

The reserves for waterworks R. 426 and R. 151, Teddington, near Maryborough, have been declared a sanctuary under the Animals and Birds Acts, and it will be unlawful to take or kill any animal or bird within the boundaries of this sanctuary.

Grade Standards for Plums.

A regulation has been issued under the Fruit and Vegetables Acts prescribing new grade standards for plums. These standards provide that all plums must be graded according to size.

Rural Topics

When Buying a Pig.

It is not every day that we buy a pig, so it is worth while remembering a few points when considering the purchase of stores. Having decided the class and type of animals required, the next thing to do is to inspect the pigs on offer. Move them around and inspect each one individually, observing defects like rupture, rough, course skin and hair, and estimating what is the real and not the apparent, average weight.

A point that cannot be overstressed is that if a pig sale is attended for the purpose of purchasing stores and there is nothing really suitable on offer, or the prices are too high, it would be wise from a financial point of view to forget all about them.

Far too many people just buy because that was their original intention, forgetting the point as to whether the pigs put up for auction are worth a higher bid.

It is important to know the highest figure that should be bid, and the one which will turn out to be economically sound when the pigs are fattened up to pork or bacon weights. The class and age of the animals, of course, must be considered, but it is just as well to make sure that there is a reasonable margin of profit in prospect when the pigs go eventually to the butcher or the bacon curer. Only a simple calculation is needed, and the error, if any, should be on the low side, for optimism may turn out to be monetarily disastrous.

It is impossible to get away from the fact that some people are born salesmen or born buyers, but the qualities of both can be cultivated. It is a good thing to know just when to "get on" or "get out," but that knowledge must go hand in hand with sound practical farm management. A note of warning: Cheap pigs in low condition are no good to any man, and must eventually cause a heavy instead of a light expenditure.

Farmers' Breeding Flocks.

The want of the right type of ewe in the breeding flock is the Queensland fat lamb raisers' present difficulty. As a straightout breed the Corriedales should meet the requirements to the greatest extent. The sheep selected for the purpose should be of the true Corriedale type, possessing large, deep, well-formed frames and producing a long fleece of 56s 58s spinning quality. Should these not be available, then an English long wool crossed on the large-framed, plain bodied merino will be found satisfactory. The trouble with this type, however, is that if conditions are suitable for fattening lambs when they are on the ewe the temptation to sell them as lambs is too great. Well-grown crossbreds at five months can be sold usually to such advantage that it pays the man on good—and, therefore, expensive—country to sell them as lambs and buy ewes at the breeding age. Practically the only ewe at breeding age that is available in Queensland is the merino.

The only way out of the difficulty is for sheep farmers on suitable country further west to breed either pure-bred Corriedales or English long wool crosses, and sell the ewe progeny when about 2-tooth to the fat lamb raisers. The advantage of breeding to the pure-bred Corriedale is that only one breed is necessary; and, as they are suitable as a farmer's flock for both wool and mutton, they serve the dual purpose with the breeder, and the surplus ewes should meet with a good demand from fat lamb raisers. Much of the brigalow lands in the medium rainfall areas, when sufficiently developed and improved, can be used to advantage for sheep breeding, and the Corriedale is, it is considered, more suited to these areas than the merino.

—*J. Carew.*

Pigs Need Exercise.

Pigs kept continuously in sties or small runs spend most of their time sleeping or trying to get out of the enclosures. They are not given any chance of getting natural exercise, and when they go to the curer or pork butcher they fail to measure up to the full requirements of their class. Feeding and farm organisation may be perfect; large litter weights and early maturity may be the watchwords of management; and careful selection of breeding stock may be all that is desirable; but if the pigs have been denied opportunities for plenty of natural exercise they will be found to be unbalanced in fat and lean when they are cut up. Breeding, feeding, and open-air management are fundamentals in successful pig farming.

Rearing of Chickens.

The successful rearing of chickens is one of the most important points in poultry farming. Any setback which chickens receive, especially during the brooding stage, will be reflected in their development. Too much trouble cannot be taken to ensure that the chickens are reared under the most satisfactory conditions that circumstances will permit.

A reliable brooder is one of the first considerations—one that will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm; and, at the same time, provide for plenty of fresh air. The brooder should be so constructed that the chickens can move away from the heat, if the temperature is too high, and get back again without any obstruction. Much of the wastage of chicken life could be avoided if due regard were paid to these fundamental factors in brooding.

The Best Type of Lamb for Export.

To meet the demands of both the home and the export trade, a true sucker lamb must be prime fat, irrespective of weight.

To produce the right lamb for export, at an age profitable to the grower, breeding is a prime essential. It follows naturally that different graziers have preferences for certain breeds of English sheep, but it may be laid down broadly that the best lamb for export is produced by a Downs sire—such as the Southdown or Dorset Horn—on ewes got by one of the long-woolled breeds—such as the Romney Marsh, Border Leicester, or Lincoln. The foundation merino ewe should be of a large-framed strong-woolled type. Corriedales make excellent breeders. Ewes in lamb should be maintained in good, strong condition, and no feed is too good for them.

From 30 to 33 lb. is the proper weight of a fat lamb, and this weight should be attained when it is about four months old.

"Don'ts" for Dairy Farmers.

Don't use cloths in the dairy—use brushes.

Don't leave skim milk about to go sour.

Don't leave utensils unscalded.

Don't fail to use boiling water to wash out the cloths used to wash the cows' teats and udders.

Don't put milk or cream in the cans which come back from the factory until they have been *scalded*, scrubbed with a brush, and aired.

Don't put a little night milk into the mornings can to fill it up.

Where milking machines are used, don't dip the tea cups in the water used to rinse the milk line—such water may spoil the milk and bring an inspector.

Don't fail to examine the milk pipe line and see that the tinning is perfect.

Don't fail to inspect the corners and crevices of the milking machine.

Don't fail to wash the hands with a clean cloth and water.

Don't fail to study the physical condition of the herd. This is more important than one would think. Especially is this very marked in drought time. The cow has the natural mother instinct very firmly rooted. With the natural resources of the body reduced to a minimum the cow commences much earlier to store up nutriment for the time when the calf arrives. Consequently, an animal which in an ordinary good season would give good milk up to six weeks before calving, would, under dry conditions, commence to reduce her milk yield three months before. A sick cow in the herd will spoil all the product.

Don't fail to examine the water supply used for both drinking and washing-up purposes. An epidemic of "ropey" milk and cream from one district was found to be caused by the wells getting low. They were cleaned out and the trouble disappeared. Low dams or creek holes are likely to give trouble.

Don't wash up with anything but boiling water, and don't rinse the utensils after washing with anything but boiled water, unless very sure that the source is good.

Don't feed on scorched young corn or water-logged saccaline.

Don't keep the cream truck waiting, and don't let the truck keep you waiting. Early delivery to the factory ensures quick treatment. Late deliveries have to wait in the lorries in the heat and so deteriorate.

The roadside pick-up should have a proper shelter, either built or thick foliaged trees. In the case of milk, one hour standing still is worse than two hours moving along.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ALL orchards and plantations should be carrying a good cover crop which will help to check erosion during the wet season and maintain the soil in good physical condition when cut and turned under.

Pineapple plantations should be kept well worked.

Pineapple growers who have missed the spring planting will usually find it better to delay activities until the end of February. The idea is to wait until the main monsoonal rains have ceased. Then the ground will still be warm and moist; while there still remains a sufficiently long growing period to enable young plants to become established before the cold weather checks growth.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Care is advised in the handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they must be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured fruit, with the bloom on and without a blemish, always sells well.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the inter-State trade should be well filled but showing no sign of ripening. The fruit be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists will be fully occupied gathering, packing, and marketing the crop of midseason fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefuly selected and properly graded and packed, they should carry as far as Cairns.

Points to remember:—

The fruit must be fully developed, but yet quite firm when gathered.

It must be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

The fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

Farm Notes

JANUARY.

FIELD.—The main business of the field during this month will be ploughing and preparing the land for the potato and other future crops, and keeping all growing crops clean. Great care must be exercised in the selection of seed potatoes to ensure their not being affected by the Irish blight. If possible, do not allow weeds to seed. This may be unavoidable in the event of long-continued heavy rains, but every effort should be made to prevent the weeds coming to maturity. A little maize may still be sown for a late crop. Sow sorghums *Setaria* Sp. (panicum), teosinte, and cowpeas. In some localities, potatoes may be sown, but there is considerable risk in sowing during this month, and it may be looked upon merely as an experiment. Plant potatoes whole. Early-sown cotton will be in bloom.

On coastal and intercoastal scrub districts, where recently burnt-off scrub lands are ready for the reception of seed of summer-growing grasses, sowing may commence as soon as the weather is suitable. Much disappointment may be saved, and subsequent expenditure obviated, by ensuring that only good germinable grass seed of varieties and quantities suitable to local conditions, is sown. The fact should be kept in mind that a good stand of grass is the principal factor in keeping down weeds and undergrowth.

In all districts where wheat, barley, oats, canary seed, and similar crops have recently been harvested, the practice of breaking up the surface soil on the cropped areas should invariably be adopted. Soil put into fit condition in this way will "trap' moisture and admit of the rains percolating into the subsoil, where the moisture necessary for the production of a succeeding crop can be held, provided attention is given to the maintenance of a surface mulch, and to the removal, by regular cultivation, of volunteer growths of all kinds. If not already seen to, all harvesting machinery should be put under cover, overhauled, and the woodwork painted where required.

Where maize and all summer-growing "hoed" crops are not too far advanced for the purpose, they should be kept in a well-cultivated condition with the horse hoe. Young maize and sorghum crops will derive much benefit by harrowing them, using light lever harrows with the tines set back at an angle to obviate dragging out of plants, but the work should not be done in the heat of the day.

Quick-maturing varieties of maize and sorghum may still be sown in the early part of the month in coastal areas where early frosts are not expected.

Succession sowings may be made of a number of quick-growing summer fodder crops—Sudan grass, Japanese and French millet, white panicum, and setaria. In favourable situations, both grain and saccharine sorghums may still be grown: also maize, for fodder purposes.

Fodder conservation should be the aim of everyone who derives a living from stock, particularly the dairyman; the present is an important period to plan cropping arrangements. Exclusive of the main crops for feeding-off (when fodder is suitable for this purpose), ample provision should be made for ensilage crops to be conserved in silo or stack. As natural and summer-growing introduced grasses may be expected to lose some of their succulence in autumn and more of it in winter and early spring, the cropping "layout" to provide a continuity of succulent green fodder throughout the season calls for thorough and deep cultivation and the building up of the fertility and moisture-holding capacity of the soil. Saccaline, white African or planter's friend (sorghum) may be sown at the latter end of the month for cutting and feeding to cattle in the autumn and early winter. Land should be prepared also for winter-growing fodder crops.

Plate 292.
Staghorn Falls, Yungaburra, Tableland, N.Q.

Plate 293. [*Photo. R. Lahey.*

NEAR WHERE THE LYRE BIRD BUILDS HER NEST.—One of the numerous waterfalls in the Lamington National Park, Macpherson Range, South Queensland.

OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

PUNISHMENT: THE HOW AND THE WHY.

THE following article is taken from the English journal, "Mother and Child," which is published by the National Council for Maternal and Child Welfare and its constituent societies:—

There is only one good reason for punishing a child—that is to make him understand that he must not repeat some action which you believe to be undesirable.

Some parents punish their child for other reasons—perhaps because what the child is doing annoys them and they want him to stop; perhaps just to "pay him back" because he has been naughty; perhaps because the parents are tired and so get angry easily. None of these reasons are good ones. They are unfair to the child. To punish him for any of these reasons will not improve his conduct or make him more inclined to be good. They will only teach him to keep out of his parents' way when tempers appear to be short.

Is He Really Naughty?

Before you punish be quite sure that what your child is doing is really naughty. Are you sure that he is not just playing some game or perhaps even trying to help you?

It is not naughty for a child to be noisy. It is not naughty for him to want to move about. It is not naughty for him to want to touch and hold things. Children need to move about and make a noise. And it is by handling and feeling things that they learn what the world round

about them is like. Of course, children do not need to be too noisy. They do not need to be rough. If they become too uproarious mother has to check them, but let her be very sure that their behaviour is unreasonable before she does so. Some children are naughty because they find it a sure way of getting mother's attention. If you have to punish your child again and again for doing the same thing, try different tactics. Praise him and give him lots of attention when he is good and pay no attention to him when he is naughty. Sometimes children are "whiny" and fretful simply because they are sleepy. The thing to do in such a case is not to slap them, but to see that they go to bed earlier, and that they have a nap in the afternoon.

Short tempers are often due to tiredness, even in the case of grown-ups, but mothers will agree that it is hardly fair to "take it out of" a child just because they are weary and irritable themselves. When people are tired they are irritated by little things that they would scarcely notice when their bodies and minds are rested. For example, one day baby may be playing with the saucepans in the kitchen earning everyone's approval for "helping mother." The next day he may do the same thing, to be rewarded with slaps for making such a noise, because mother happens to have a headache after a bout of washing. Now, is that fair to baby? Why was he slapped? Because he was naughty, or because mother was tired?

The wise mother will see to it that she has some rest each day. It will keep her from becoming overtired and help her to remain serene in dealing with her children.

Children Know What is Just.

Children are very keenly aware of justice and injustice. They know, for instance, that if they have been teasing their playmates it is fair for them to be made to play alone for a while. They know it is fair not to be given sweets when they have refused to eat their vegetables. They do not like these punishments, of course, but they do know they are fair.

Some punishments are much better than others. Smacking, scolding, locking a child in a room by himself, or forbidding him to play out of doors are not good ways of punishing, and the wise mother does not resort to them. She knows of much more effective ways of persuading her child to be good.

Perhaps her little boy has been bullying the children he plays with. She does not smack him or scold him, but she stops him from playing with them till he is ready to play nicely. If he forgets and renews his bad behaviour, then he must play alone again. Sooner or later he will learn that he must not hurt his playmates, because he wants to play with them; children do not like to be alone.

Another example—perhaps he does not come straight home from school or perhaps he does not come in when he is called. Mother does not say "To-morrow you cannot go out to play" because she knows he needs to be out in the fresh air and that it would be bad for him to go without play. Instead she deprives him of some small treat which it will not hurt him to go without.

Children who are naughty because they are tired do not need to be punished; they need to rest.

Some Golden Rules.

Pay no attention is a very useful rule for parents in a great many circumstances, particularly where temper, tantrums and fussiness about food are concerned.

The best plan of all, of course, is to keep your child from needing to be punished. This can be done if mother begins the task when he is a baby and bears in mind that she should:—

1. Pay attention to him when he is good and not only when he is naughty.

2. Always do what she promises.

3. Speak and act the truth to her child.

4. Never threaten a baby with punishments she cannot carry out.

5. Never laugh at or praise him for something one day, and scold or punish him for the same thing to-morrow.

6. Remember that a healthy child cannot sit still or be quiet all the time. Every child needs plenty of out-door play—running, jumping, and climbing.

7. Keep him so busy with interesting things to do that he has no time to be naughty.

If you do not like what your child is doing, give him something else to do; don't scold him. Remember that none of his toys are half so interesting to him as the everyday things of the home—the pots and pans, the vegetables you are peeling for dinner, the coal in the scuttle. He wants to find out all about them, and it is very desirable he should do so. Let him have the things he cannot break. Put away the things he should not have so that he won't see them. Then he will not ask for them, and you need not say no. Above all, do not try to make your child "good" by frightening him. Don't say, "If you're not good the policeman will come and take you away." Don't frighten him with dreadful things that the doctor or the dentist will do to him if he is naughty. You will make him afraid of people whom he should come to regard as friends—the policeman, who is someone who will always lead him safely across the road, the doctor or dentist, whom he should trust as kindly people who always want to make him feel well and better. Worse still, you will teach him not to trust you.

Do not use punishments to make him afraid of the dark. When he was a baby he was not afraid of the dark, but you will make him so if you lock him away in the dark when he is naughty.

All human beings, children included, have to learn that we all pay, in some way or other, for the bad things we do, but punishments must not be so severe that children will tell lies to escape it. Whipping children, slapping them and putting them in dark cupboards are punishments that make them afraid and cause them to tell lies. The untruthful child is generally the pitiful little child who has been made afraid.

Plate 294.

The Beauty of a Well-Kept Hedge.—In these terraced grounds, dry-stone walls are covered with a dense growth of Rhinospermum—the glory of the garden when in scented bloom.

Plate 295.
Sunset at Palm Island, North Queensland.

IN THE FARM KITCHEN.

CHRISTMAS PUDDINGS AND SAUCES.

Christmas Pudding.

Take ½ lb. suet, ½ lb. raisins, ¼ lb. flour, ¼ lb. currants, ¼ lb. peel, ¼ lb. sultanas, 1 oz. almonds, grated rind ½ lemon, 2 tablespoonfuls golden syrup, 2 eggs, ½ gill milk, ¼ nutmeg (grated).

Prepare the fruits. Chop the suet. Mix the flour and suet together. Add the lemon rind, nutmeg, and prepared fruits. Cut the peel into small pieces, blanch the almonds and cut into pieces. Add these to the other ingredients and mix well. Whisk up the eggs, add the golden syrup, and whisk together. Put into a greased basin, cover with greased paper and floured pudding cloth. Put into a saucepan of boiling water and steam for eight hours. Turn on to a hot dish and serve.

Children's Christmas Pudding.

Take ¾ lb. grated beef suet, 1 lb. breadcrumbs, ¼ lb. fine flour, ¾ lb. raisins (stoned and chopped), ¼ lb. sultanas, grated rind and juice 2 oranges, ½ teaspoonful salt, 4 eggs, ½ lb. golden syrup, ½ pint milk.

Mix the dry ingredients first, warm the syrup, and mix with the beaten eggs and milk, add the strained orange juice; then work the whole into a stiff paste very thoroughly. Keep over for two days, mix again, then put into two well-greased moulds, tie down securely, and boil for four hours. Boil for another hour when going to use the puddings. A few blanched and split almonds should decorate the puddings when turned out of the moulds.

Plum Pudding.

Take 1 lb. currants, 1 lb. sultanas, 1 lb. sugar, ¾ lb. finely-chopped suet, ½ lb. flour, ½ lb. breadcrumbs, 1 lb. raw carrots (finely grated), 3 oz. candied peel, 1 oz. salt, 2 eggs, 1 grated nutmeg, ginger and cinnamon to taste.

Put all the dry ingredients into a large mixing basin. Cut up the candied peel very finely. Mix all well together and add the well-beaten eggs. Make the pudding two weeks before wanted, and steam it for six hours. Hang it up in the cloth in which it was boiled until it is required, when boil again for one or two hours. No milk or other moisture is required in mixing this pudding.

Rich Christmas Pudding.

Take 1 lb. finely-chopped suet, 1 lb. brown sugar, 1 lb. stoned raisins, 1 lb. currants, ¼ lb. candied peel (cut in thin slices), ½ lb. flour, 8 oz. breadcrumbs, 8 eggs, 3 oz. almonds (blanched and shredded), 1 saltspoonful grated nutmeg, 2 teaspoonfuls baking powder, grated rind of 1½ lemons, 1 teaspoonful salt, about ½ pint milk, 1 gill brandy.

Thoroughly mix together all the dry ingredients, then stir in the eggs, which have been well beaten; add gradually the milk and, lastly, the brandy. This quantity will make four good-sized puddings. Place in buttered moulds or basins, and steam for five hours. When needed for table, steam another two hours. Serve with any sauce which is preferred.

Christmas Pudding.

Take 3 oz. flour, 6 oz. suet, 3 oz. breadcrumbs, 6 oz. stoned raisins, 6 oz. currants, 4 oz. minced apple, 3 eggs, 5 oz. sugar, 2 oz. candied peel, ½ teaspoonful spice, 1 small wineglassful brandy, pinch of salt, ½ teaspoonful nutmeg.

Mix together the flour, breadcrumbs, chopped suet, raisins, currants, minced apples, sugar, peel (minced small), nutmeg, spice, a pinch of salt, the brandy and whole eggs. Mix and beat these ingredients well together, pour them into a well-buttered mould or basin, spread a buttered paper over, then tie a cloth firmly over the top. Boil for four hours, keeping the pudding well covered with boiling water, then turn it out, sift icing sugar thickly over the top, pour two or three tablespoonfuls of brandy round, and, just before serving, set it alight. This pudding may be served with wine or punch sauce, or with rum or brandy butter.

Individual Christmas Puddings.

Take 4 oz. suet, ½ lb. raisins, ¼ lb. currants, 2 oz. sultanas, 2 oz. candied peel, 1 oz. shelled walnuts, 4 oz. sugar, 3 oz. breadcrumbs, 1½ oz. flour, grating of nutmeg, ¼ flat teaspoonful ground cloves, 2 eggs, ½ gill rum.

Wash, pick over, and dry the fruits and stone the raisins. Shred the candied peel and chop up the walnuts. Sieve the flour with the spices, add the finely-chopped suet, and the breadcrumbs, then stir in the sugar, prepared fruits and nuts, and mix all together. Whisk the eggs and add them. Moisten the mixture with the rum and some milk as required. Beat it well and leave it to stand overnight, adding more moisture after that time, if necessary. Turn the mixture into six buttered moulds. Cover them securely with buttered papers and steam them for about an hour and a half or two hours. Unmould the puddings and serve them with half a shelled walnut on each.

hristmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins, ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, 6 oz. flour, 1½ gills ale, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in the suet, then the blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale, cover, and leave for several days, stirring once daily. Pack into two buttered basins. Cover with buttered paper, then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water coming half way up the sides. When required, cook for three hours, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Economical Christmas Pudding.

Take ½ lb. beef suet, ¼ lb. flour, ¼ lb. breadcrumbs, 6 oz. cleaned currants, 6 oz. stoned raisins, ¼ lb. brown sugar, ¼ lb. cooked carrot, ¼ lb. cooked potato, 2 oz. candied peel (finely shredded), 1 teaspoonful salt, 2 tablespoonfuls brown treacle.

Rub the carrot and potato through a sieve. Mix together all the dry ingredients with the sieved carrot and potato, and this will require time, as it is not easy to mix them well without moisture. Last of all stir in the treacle, after warming it until it runs. Mix very thoroughly, and keep in the mixing basin several days, stirring the pudding every day. Then put into a large basin (well greased), cover with greased paper and thick dry paper over all, and steam for six hours. When re-heating, allow two hours for steaming through. Serve with brandy sauce or custard.

Almond Sauce.

Take ¼ lb. ground almonds, 2 oz. castor sugar, 1 whole egg and 3 yolks, ¼ pint cream, ¼ pint milk, 1 wineglassful brandy, ½ teaspoonful essence of bitter almonds.

Pound the almonds and sugar together in a basin, and add the egg and egg-yolks (well beaten), then milk and cream by degrees. Turn into a jug, place this in a saucepan of hot water, and stir till the mixture thickens, which will take quite a quarter of an hour. Remove from the heat and continue stirring at intervals till nearly cold, add brandy and essence, and heat again in the saucepan before serving.

Brandy Sauce.

Take 2 oz. butter, 2 oz. flour, ½ pint milk, pinch of salt, sugar, brandy.

Dissolve the butter, and work into it the flour until perfectly smooth; then dilute with the milk, slightly warmed. Add the salt, and bring to the boil, stirring all the time. Boil for two minutes, then add a little thick cream or another pat of cold butter. Pour a wineglass of brandy over six lumps of sugar; when dissolved, stir into sauce, which should not boil again.

Punch Sauce.

Take 2 oz. sugar, 1 oz. butter, 1 teaspoonful rice flour, ½ wineglassful rum, ½ wineglassful marsala, ½ wineglassful brandy, lemon, orange, 1 gill water.

Put the sugar on to boil with the water, the rind of half a small lemon (pared very thinly), and a rather smaller quantity of orange-peel. Let them simmer for fifteen minutes, then take out the peel. Mix the rice flour quite smoothly with a little cold water, and stir into the boiling syrup. Add the butter in small pieces, then the strained juice of half the orange, also a teaspoonful of the lemon juice. Boil for ten minutes, then add the rum, marsala, and brandy, but do not let the sauce boil after they are added.

Hard Sauce.

Take 4 level tablespoonfuls of butter, 2 level tablespoonfuls castor sugar, 4 teaspoonfuls brandy, pinch of grated nutmeg.

Beat the butter to a cream, beat in the sugar, then the brandy and nutmeg. Heap the mixture in a glass dish, and put it on ice or in a cold place until required.

SUMMER FRUIT DRINKS.

Nothing is more refreshing or pleasing in warm weather than a well-prepared fruit drink, while from a health point of view the habit of drinking fruit juices needs no stressing. Their wholesomeness may be particularly emphasised as beverages for children, who, left to their own devices, are quick to acquire the taste for them. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious to the child's health.

The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice. Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

Pineapple Drink.—Wash the skin of pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly three-quarters of an hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

Fruit Punch.—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemond rind, 1 quart water, 3 or 4 cups of sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemond juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ¼ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

Fruit Cup.—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passion-fruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemons, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices or oranges, passion-fruit pulp, and cut pear or other fruit. Place in ice chest and serve very cold.

PASTEURISATION.

The object of pasteurisation is, firstly, to make milk and milk products safe, by destroying any disease germs that may be present; and, secondly, to improve the keeping quality of butter and cheese made from milk and cream so treated. Pasteurisation, however, has its limitations. It cannot perform miracles—such as improving the grade of cream from second to choice, or eliminating strong weed taints.

Most dairy farmers are aware of this, and know that the production of choice quality cream depends on the care and attention given on the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON

Divisions and stations.	Average Rainfall.		Total Rainfall.		Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1937.	Oct., 1936.		Oct.	No. of years' records.	Oct., 1937.	Oct., 1936.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	0·94	36	0·21	0·71	Clermont ..	1·31	66	0·32	0·32
Cairns	2·13	55	0·03	0·16	Gindie	1·37	38	..	..
Cardwell	2·05	65	0·28	0·18	Springsure ..	1·64	68	1·06	0·32
Cooktown ..	1·03	61	0·75	0·15					
Herberton ..	0·99	51	0·14	0·87					
Ingham	1·90	45	0·02	0·05					
Innisfail	3·27	56	0·55	0·19					
Mossman Mill ..	3·02	24	0·18	0·11	*Darling Downs.*				
Townsville ..	1·33	66	0·90	..					
					Dalby	2·04	67	3·41	0·50
Central Coast.					Emu Vale ..	2·17	41	2·89	0·53
					Hermitage ..	1·86	31	..	0·34
Ayr	0·92	50	0·22	..	Jimbour ..	1·87	49	1·50	0·75
Bowen	1·01	66	1·13	..	Miles	2·02	52	2·11	0·28
Charters Towers ..	0·72	55	0·67	0·03	Stanthorpe ..	2·53	64	1·72	0·73
Mackay	1·71	66	2·29	2·09	Toowoomba ..	2·54	65	4·70	0·25
Prosperine ..	1·60	34	2·05	0·15	Warwick ..	2·29	72	3·81	0·47
St. Lawrence ..	1·77	66	3·63	0·56					
South Coast.									
					Maranoa.				
Biggenden ..	2·40	38	4·52	0·61					
Bundaberg ..	2·09	54	3·64	0·93	Roma	1·76	63	0·96	0·36
Brisbane	2·54	85	3·59	0·16					
Caboolture ..	2·50	50	7·16	0·51					
Childers	2·69	42	5·46	1·32					
Crohamhurst ..	3·27	44	5·06	1·53					
Esk	2·49	50	10·13	0·22					
Gayndah	2·39	66	3·69	1·62					
Gympie	2·70	67	4·95	0·92	*State Farms, &c.*				
Kilkivan	2·61	58	4·80	2·34					
Maryborough ..	2·76	66	1·81	1·10	Bungeworgorai ..	1·50	22	..	..
Nambour	3·07	41	8·76	1·05	Gatton College ..	1·96	38	5·37	0·15
Nanango	2·25	55	2·47	0·72	Kairi	1·02	21	..	..
Rockhampton ..	1·77	66	2·27	0·86	Mackay Sugar Experiment Station	1·47	40	1·54	2·47
Woodford	2·54	50	7·32	0·42					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·95	84	73	97	21	60	22	75	2
Herberton	..	82	56	89	30	45	22	14	2
Rockhampton	30·01	89	65	97	25	57	20	227	3
Brisbane	30·02	82	63	99	24	58	14	359	9
Darling Downs.									
Dalby	30·01	83	56	97	25, 26	44	19, 3	341	7
Stanthorpe	..	76	49	91	26	37	3, 19	172	8
Toowoomba	..	77	54	92	24	44	3	470	8
Mid-Interior.									
Georgetown	29·94	96	65	102	25, 27	49	20	5	1
Longreach	29·94	96	63	107	26, 27	49	19	6	1
									2
Mitchell	29·98	88	54	103	26	42	2	79	
Western.									
Burketown	29·94	93	69	100	12	58	20	Nil	..
Boulia	29·90	96	63	107	26	50	17	Nil	..
Thargomindah	29·95	89	62	105	23	50	1, 17	Nil	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December. 1937.		January. 1938.		Dec. 1937.	Jan. 1938.
	Rises.	Sets.	Rises.	Sets.	MOONRISE. Rises.	MOONRISE. Rises.
					a.m.	a.m.
1	4·49	6·31	5 1	6·50	3·19	4·19
2	4·49	6·32	5·2	6·50	4·0	5·9
3	4·49	6·33	5·2	6·50	4·44	6·5
4	4·50	6·34	5·3	6·51	5·32	6·59
5	4·50	6·35	5·3	6·51	6·22	7·51
6	4·50	6·36	5·4	6·51	7·16	8·46
7	4·50	6·37	5·5	6·51	8·9	9·41
8	4·50	6·38	5·5	6·52	9·3	10·36
9	4·51	6·38	5·6	6·52	9·57	11·33
						p.m.
10	4·51	6·39	5·7	6·52	10·48	12·23
11	4·51	6·39	5·8	6·52	11·48	1·36
					p.m.	
12	4·51	6·40	5·9	6 51	12·44	2·43
13	4·52	6·40	5·9	6·51	1·45	3·48
14	4·52	6·41	5·10	6·51	2·49	4·51
15	4·52	6·41	5·11	6·51	3·55	5·51
16	4·52	6·42	5·12	6·50	5·4	6·41
17	4·53	6·42	5·13	6·50	6·8	7·27
18	4·53	6·43	5·13	6·50	7·9	8·9
19	4·53	6·43	5·14	6·50	8·7	8·49
20	4·54	6·44	5·15	6·50	8·55	9·29
21	4·54	6·44	5·16	6·49	9·40	10·5
22	4·55	6·45	5·17	6·49	10·18	10·47
23	4·55	6·45	5·18	6·49	10·56	11·18
24	4·56	6·46	5·19	6·49	11·39	11·58
25	4·56	6·46	5·19	6·48	..	..
					a.m.	a.m.
26	4·57	6·47	5·20	6·48	12·4	12·39
27	4 58	6 48	5·21	6·48	12·42	1·24
28	4·58	6·48	5·22	6·48	1·19	2·13
29	4·59	6·49	5·23	6·47	2·0	3·4
30	4·59	6 49	5·24	6·47	2·42	3·57
31	5·0	6·50	5·25	6·47	3·28	4·52

Phases of the Moon, Occultations, &c.

3rd Dec.	●	New Moon	9 11	a.m.
11th „	☽	First Quarter	11 12	a.m.
19th „	○	Full Moon	4 52	a.m.
25th „	☾	Last Quarter	12 20	a.m.

Apogee, 4th December, at 3 a.m.
Perigee, 17th December, at midnight
Apogee, 31st December, at 4 a.m.

Mercury rises at 5.54 a.m., 1 hour 5 minutes after the Sun, and sets at 7.36 p.m., 1 hour 5 minutes after it, on the 1st; on the 15th it rises at 6.19 a.m., 1 hour 27 minutes after the Sun, and sets at 8.12 p.m., 1 hour 31 minutes after it.

Venus rises at 3.54 a.m., 55 minutes before the Sun, and sets at 5.18 p.m., 1 hour 13 minutes before it, on the 1st; on the 15th it rises at 4.2 a.m., 50 minutes before the Sun, and sets at 5.45 p.m., 56 minutes before it.

Mars rises at 9.23 a.m. and sets at 11.21 p.m. on the 1st; on the 15th it rises at 9.33 a.m. and sets at 10.44 p.m.

Jupiter rises at 8.14 a.m. and sets at 9.56 p.m. on the 1st; on the 15th it rises at 7.34 a.m. and sets at 9.13 p.m.

Saturn rises at 1.1 p.m. and sets at 1.21 a.m. on the 1st; on the 15th it rises at 12.8 p.m. and sets at 12.25 a.m.

On the 22nd, the day of our summer solstice, the Sun will be directly overhead at midday at all places 23½ deg. south of the celestial equator, and its vertical rays will make themselves felt more or less uncomfortably "We go in a circle by night, that we may not be consumed by fire" (a saying from the Latin, its origin unknown). Asked for an explanation, Mr. Eglinton answered that were there no circular movement around the earth's axis unmitigated heat would soon consume us. But in Spitzbergen at midsummer there is sunshine day and night—on account of the tilt of the earth's axis—and the "dazzling Sun" was seen there at midnight last June "over the silver birches and a range of low hills"; but a Finnish author said of such a night: "The whole nature is beaming, all is so soft, so clear, the most common objects are enveloped in an enchanting light. . . ."

In our hemisphere the finest of the northern constellations are now coming into view, rising a little earlier night by night. On Christmas Eve and later, when the Moon has waned, the Pleiades, the Hyades, Orion, and Canis Major, with Sirius, will form a brilliant curve in the north-east, while the great ship Argo, with Canopus, stretches full length from the Southern Cross to Canis Major, east of the zenith.

2nd Jan.	●	New Moon	4 58	a.m.
10th „	☽	First Quarter	12 13	a.m.
16th „	○	Full Moon	3 53	p.m.
23rd „	☾	Last Quarter	6 9	p.m.

Perigee, 15th January, at 12 noon
Apogee, 27th January, at 4.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.